IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

THE HOLMES GROUP, INC.,	:	
	:	
Plaintiff,	:	Civil Action No. 05-CV-11367 WGY
v.	:	(Alexander, M.J.)
	:	
WEST BEND HOUSEWARES, LLC and FOCUS PRODUCTS GROUP, L.L.C.,	:	
	:	
Defendants.	:	

PLAINTIFF'S COUNTER-STATEMENT OF MATERIAL FACTS AS TO WHICH A GENUINE ISSUE OF DISPUTE EXISTS

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October 12, 2006

Pursuant to Rule 56.1 of the Local Rules for the United States District Court for the District of Massachusetts, Plaintiff submits that there exists genuine issues of material fact to be tried as set forth below:

1. Plaintiff, The Holmes Group, Inc., now known as Sunbeam Products, Inc., d/b/a/ Jarden Consumer Solutions, (hereinafter "Holmes") brought this action against Defendants West Bend Housewares, LLC and Focus Products Group, LLC (collectively referred to as "West Bend") for infringement of Holmes' U.S. Patent Nos. 6,573,483 and 6,740,855 entitled "Programmable Slow-Cooker Applicant" ("the '483 Patent" and "the '855 Patent," respectively). A copy of the '483 Patent is attached as Exhibit A and a copy of the '855 Patent is attached as Exhibit B. The '855 Patent is a continuation of the '483 Patent. Thus, the specification and figures are the same, only the claims differ. Accordingly, reference to the '483 Patent specification applies equally to the '855 Patent.

2. The Holmes patents relate to a structure and method of using a programmable slow-cooker appliance. (Ex. A, Col. 5, line 43 - Col. 6, line 27).

3. Subsequent to the market introduction of a programmable slow-cooker by Holmes covered by the Holmes patents, West Bend began marketing and selling programmable slow-cookers (West Bend Housewares 6 Quart Oval Slow Cooker, Model 84386) which infringe the '483 and '855 patents. A copy of the Instruction Manual for the accused West Bend programmable slow-cooker is attached as Exhibit D, App. B.

4. Generally, the programmable slow-cooker covered by the Holmes patents permits the consumer to select a cooking time and temperature. At the expiration of the set cooking time, the appliance automatically reduces power to the heating element to place it in a keep

warm mode. Thus, the cooked food is maintained at a serving temperature and prevents spoilage in the event the user is not available at the end of the set cooking time to attend to the appliance. (Ex. A, Col. 5, line 43 - Col. 6, line 27).

5. The '483 and '855 patents also disclose and claim novel structure for cooling the electrical circuit for the programmable slow-cooker. However, Holmes has not asserted any claims directed to the cooling feature in this lawsuit. (Ex. A, Col. 1, lines 31-49).

6. On September 27, 2006, this Court held a Markman Hearing to construe claim limitations to which the parties could not agree. The Court rendered its opinion on claim construction at the Markman Hearing. A copy of the Markman Hearing transcript is attached as Exhibit E. A chart including the claim limitations and the construction of those limitations by the Court is attached as Appendix D to the Declaration of Professor David L. Trumper (Ex. D) in support of Plaintiff's response to West Bend's motion for partial summary judgment of non-infringement. In view of the Court's claim construction, Holmes served supplemental interrogatory responses to include assertion of infringement under the doctrine of equivalents, a copy of which is attached as Exhibit C.

The Patents-In-Suit

7. The '483 and '855 Patents include claims at issue which are directed to a programmable slow-cooker appliance which allows a user to select a cooking temperature and a cooking time using a programmable controller. The programmable slow-cooker automatically switches the heating element from a cooking mode to a lower temperature warm mode at the expiration of a set cooking time. (See Ex. A, Claim 13; Ex. B, Claim 20).

8. The asserted claims in the ‘483 patent and ‘855 patent do not require any cooling of electronic components. The patents-in-suit disclose and claim novel structure for cooling an electrical circuit of a programmable slow-cooker appliance; however, none of the claims directed to the cooling feature have been asserted in this lawsuit. (Ex. A, Claims 13, 14, 17 and 19; Ex. B, Claim 20, 24, 26, 27 and 29).

9. The “Summary of the Invention” identifies two aspects of the invention. The first aspect is directed to the novel structure for cooling the electronic circuit of the programmable slow-cooker. “Another aspect of the invention is a method of using the programmable controller to ensure that food is cooked according to the desires of a user.” (Ex. A, Col. 1, lines 50-53).

10. Claim 13 of the ‘483 patent defines a method of using a programmable slow-cooker appliance, wherein the method includes the steps of selecting a cooking temperature and time using a programmable controller and changing the heating unit temperature automatically to a lower temperature at the expiration of the selected cooking time. (Ex. A, Claim 13; *see also* Col. 6, lines 8-19).

11. Cooling of the electronic components does not form a part of Claim 13 of the ‘483 patent or Claim 20 of the ‘855 patent. (Ex. A, Claim 13).

12. The programmable slow-cooker disclosed in the ‘483 Patent is provided with a programmable control 200, (see Fig. 4) which preferably includes a circuit board housing 210, a control panel 220, and an insulation shield 222 assembled together for attachment to the outer sidewall 18 of the heating unit 12. The interior of the housing 210 contains a printed circuit board 254 containing electronic components. The housing 210 preferably includes a control panel user interface 224 located on a front surface of the housing. (Ex. A, Col. 3, lines 12-21).

13. The programmable control 200 is fixedly mounted to and located on the outside sidewall 18 of the heating unit 12. (Ex. A, Col. 3, lines 12-18).

14. The Court construed "a programmable slow-cooker appliance" as "*a cooking device designed for cooking food at a constant relatively low cooking temperature for a relatively long period of time [being], being programmable to operate in a variety of different cooking modes and cooking times.*" (Ex. E, p. 3, lines 7-12).

15. The Court construed the corresponding term in Claim 20 in the same manner. (Ex. E, p. 25, lines 8-15).

16. The specification of the '483 Patent supports the construction of the "programmable slow-cooker appliance" by the Court. See Abstract, Background, and the Summary of the Invention as well as the introductory two paragraphs of the Detailed Description of the Drawings and Preferred Embodiments (Ex. A, Col. 1-3). The programmable feature of the slow-cooker allows it to operate at any number of different cooking modes and cooking times. (Ex. A, Col. 5, line 44 - Col. 6, line 20).

17. The Instruction Manual for the West Bend programmable slow-cooker describes a cooking device designed for cooking food at constant, relatively-low cooking temperatures for a relatively long period of time, and being programmable to operate at a variety of different cooking modes and cooking times. As stated in the Instruction Manual, when the cooking cycle is complete, the cooker shifts to the warm setting. (Ex. D, ¶ 20).

18. The West Bend programmable slow-cooker includes a heating unit (12), and a cooking unit (14) in a form of a ceramic cooking vessel. The heating unit (12) is formed by an interior (17) an outer sidewall (18) and a bottom (16). The interior sidewall (17) and bottom (16) define a well-like heating chamber (20), which is shaped to receive the ceramic cooking unit (14). A heating element (24) is secured to an outer surface of the interior sidewall (17). The West Bend programmable slow-cooker also includes a programmable control (200), which includes a circuit board housing (210), programmable circuit (300), and a control panel user interface (224) on the front surface of housing (210), specifically on the front surface of the outer housing shell (210B). The control panel user interface (224) has buttons for setting a cooking time and cooking temperature and light emitting diodes ("LED's") and digital readouts for indicating cooking time and cooking temperature. (Ex. D, ¶ 22, App. C, photos 1-4, 8, 10 and 12).

19. The Court construed the term ***"a programmable controller"*** of Claim 13 of the '483 Patent as *"a form of an electrical circuit or circuits including input and output devices which permit an operator to select a cooking temperature and cooking time."* (Ex. E, p. 20).

20. The Court, consistent with its interpretation for "a programmable controller," construed the term ***"a programmable circuit"*** of Claim 20 of the '855 Patent as, *"a circuit, including an assemblage of electronic components, which allows the user to program both the temperature and desired time for cooking, and which can automatically change the heating element from a cooking mode to a warm mode once the cooking time has expired…The programmable circuit does not include the heating element, the control panel, displays, and buttons."* (Ex. E, p. 38).

21. The '483 Patent discloses a programmable circuit (300) which includes input devices and output devices, such as switches, (S1, S2), light emitting diodes (LED's) (D3-D8), thermistor (310), microprocessor (302), Triac (304) and other electronic components (resistors, capacitors, diodes, etc.). (Ex. A, Figs. 10 and 13). The programmable circuitry 300 allows the user to set both the temperature and desired time for cooking. (Ex. A, Col. 5, lines 44-46; Ex. D, ¶ 26).

22. The West Bend Model No. 84386 programmable slow-cooker includes *"a programmable controller"* of Claim 13 of the '483 Patent as construed by the Court and *"a programmable circuit,"* as interpreted by the Court for Claim 20 of the '855 Patent. The West Bend programmable slow-cooker includes a programmable electrical circuit (300), including input and output devices, for example a microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) and light emitting diodes (LED's) (D3-D8)), which permit an operator to select a cooking temperature and cooking time. (Ex. D, ¶ 28, App. C, photos 10 and 12).

23. The phrase ***"mounted to a housing fixedly mounted to a heating unit"*** in Claim 13 of the '483 Patent was construed by the Court as,*"[the housing is] mounted to and located on the …outside, or at least overwhelmingly or generally outside…of the heating unit."* (Ex. E, pp. 20-21, 24).

24. The Court construed ***"a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit"*** in Claim 20 of the '855 Patent as *"that it is [a housing] mounted to and largely outside the outer sidewall of the heating unit and extending at least beyond an outer surface of the sidewall of the heating unit."* (Ex. E, p. 35).

25. The West Bend Model No. 84386 programmable slow-cooker includes the limitation of Claim 13 of the '403 Patent of ***"a programmable controller mounted to a housing fixedly mounted to a heating unit,"*** as well as the corresponding element in Claim 20 of the '855 Patent, namely, ***"a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit."*** (Ex. D, ¶ 34)

26. Specifically, as shown in photos 4-6, 8 and 10 (App. C) the West Bend programmable slow-cooker includes a printed circuit board housing (210) formed by *an inner housing shell (210A) (white plastic) and an outer housing shell (210B)*. The control panel user interface (224) is located on the front face of the *outer housing shell (210B).* The outer sidewall (18) of the West Bend programmable slow-cooker has a cutout to accommodate the printed circuit board housing (210) enclosure and provide access for wires connecting to electronic components of the programmable circuit (300) mounted within the heating unit (12). The *inner housing shell (210A)* is attached to the inner surface of outer sidewall (18) by screws which are fastened from the outside of the heating unit outer sidewall (18). The *outer housing shell (210B)* covers the *inner housing shell (210A)* and is affixed to the exterior of the outer sidewall (18) of the heating unit (12) by screws fastened from the inside of the outer sidewall (18). The *inner housing shell (210A)* and *outer housing shell (210B)* having the control panel user interface (224) on its front face form the circuit board housing (210) enclosure, which is mounted to and located on the outer sidewall (18) of the heating unit (12). (Ex. D, ¶ 35)

27. Both the *inner housing shell (210A)* and the *outer housing shell (210B)* are fixedly mounted by screws to, and extend beyond, the outer surface of the sidewall (18) of the heating unit (12). The entire *outer housing shell (210B)* extends outwardly from the outer sidewall. (App. C, photos 1, 2, 5, 10 and 12; Ex. D, ¶ 36).

28. West Bend's portion of the housing (210) within the heating unit (12) is merely an insubstantial change which accomplishes the function of the invention (i.e., programming a cooking time and temperature and automatically changing the heating unit temperature from a cooking mode to a lower temperature warm mode at the end of a selected time) in substantially the same way to achieve substantially the same result. (Ex. D, ¶ 37).

29. The way to achieve the cooking method function is by providing a programmable circuit (300) which can program a cooking time and temperature. Additionally, the programmable circuit (300) is configured to automatically change power to the heating element to switch from a cooking mode to a lower temperature warm mode at the expiration of a set cooking time. West Bend's device includes a programmable circuit (300) to accomplish these functions. West Bend's device also includes a housing (210) fixedly mounted to the heating unit (12). West Bend's housing (210) or enclosure includes portions which extend both into the heating unit (12) as well as projecting outwardly beyond the outer surface of the outer sidewall (18) of the heating unit (12). The housing of the West Bend device accomplishes the function of providing an enclosure (210) for the programmable controller in substantially the same way to achieve substantially the same result as the claimed housing, as construed by the Court. (Ex. D, ¶ 38).

30. Any differences between the claimed housing in the asserted claims and the West Bend structure are merely insubstantial. The function of the housing (210) is to provide an enclosure for at least a portion of the programmable circuit. The way in which this function is accomplished is by providing housing portions which are fixedly mounted to the outer sidewall of the heating unit to form the enclosure (210). The result is substantially the same since the enclosure (210) projects outwardly beyond an outer surface of the sidewall (18). (Ex. D, ¶ 39).

31. The Court construed the phrase ***"a programmable circuit positioned within said housing"*** of Claim 20 of the '855 Patent as, *"a circuit, including an assemblage of electronic components, which allows the user to program both the temperature and desired time for cooking, and which can automatically change the heating element from a cooking mode to a warm mode once the cooking time has expired. The circuit, not just a portion of the circuit is positioned within the housing. The programmable circuit does not include the heating element, the control panel, displays, and buttons."* (Ex. E, p. 38).

32. The '483 Patent describes the programmable circuit (300), illustrated in Figs. 10 and 13, to include input devices and output devices, such as switches, (S1, S2), LED's (D3-D8), a thermistor (310), microprocessor controller (302), Triac (304), and other electronic components (resistors, capacitors, diodes, transistors, etc.). (Ex. A, Col. 4, lines 48-68 and Col. 5, lines 1-46). The '483 Patent discloses that some components of the programmable circuit (300) are connected externally of the printed circuit board (254). For example, the Triac 304, an electronic component of the programmable circuit (300) which switches power applied to the heating elements, is disclosed as preferably "mounted to one of the mounting holes… of the heat sink 256." (Ex. A, Col. 5, lines 29-36). The '483 Patent further states that "[m]ost of the other components of the [programmable] circuit 300 are mounted on a conventional printed circuit board 254." (Ex. A, Col. 5, lines 38-40). Similarly, the '483 Patent states that, "[t]he temperature of the cooking appliance is measured using a thermistor 310, which is connected externally of the circuit board to the underside of the bottom of the heating chamber." (Ex. A, Col. 5, lines 22-25). Thus, components of the programmable circuit are taught to be mounted external to the printed circuit board. (Ex. D, ¶ 42).

33. The ‘483 Patent teaches that the programmable circuit (300) illustrated and described is merely exemplary and that “one skilled in the art will recognize that… many other components may be substituted to achieve the functions described herein”. (Ex. A, Col. 4, lines 54-57; Col. 5, lines 16-19). Therefore, persons skilled in the art understand that various circuit components may be used in various arrangements both inside and outside of the printed circuit board housing (210) to achieve the desired functions of the programmable circuit (300). (Ex. D, ¶ 43).

34. The ‘483 and ‘855 Patents disclose that some of the programmable circuit is located on the circuit board (254) positioned within the housing (210) affixed to the outer sidewall of the cooking unit, but that other components of the programmable circuit may be located outside of the housing (210). In fact, to operate properly, the thermistor (310) component of the programmable circuit must be located outside the circuit board housing. (Ex. D, ¶ 44).

35. The West Bend Model No. 84386 programmable slow-cooker includes, ***“a programmable circuit positioned within said housing”***, as defined in Claim 20 of the ‘855 Patent. The West Bend programmable slow-cooker includes ***“a programmable circuit,”*** namely, a circuit (300), including an assemblage of electronic components (microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) and light emitting diodes (LED’s)(D3-D8)) which allows the user to program both the temperature and desired time for cooking and which can automatically change the heating element (24) from a cooking mode to a warm mode once the set cooking time has expired. Components of the circuit (300), namely switches (S1-S2) and light emitting diodes (LED’s)(D3-D8)), surface mounted resistors, capacitors and electronic logic devices (IC’s) connected to the other components of the programmable circuit

(300) with traces on the surface of the printed circuit board (254) and by external wiring, allows the user to program both the temperature and desired time for cooking and are mounted on a printed circuit board (254) inside the housing (210). (Ex. D, ¶ 45).

36. The West Bend programmable slow-cooker includes a thermistor (310) and Triac (304) which are both mounted externally to the printed circuit board (254). Additionally, these elements are positioned within the interior space of the heating unit (12), located outside of the housing (210). The '483 Patent states that some components of the programmable circuit (300) are connected externally of the circuit board (254), such as the thermistor (310) and Triac (304). (Ex. D, ¶ 46).

37. As shown in photos 8-10 and 12-13 (App. C) the West Bend programmable slow-cooker includes components of the programmable circuit (300) on printed circuit board (254) provided inside printed circuit board housing (210) and other components of the programmable circuit (300), including a microprocessor controller (302), resistors, diodes and capacitors on a *second printed circuit board (255)* in a *second printed circuit board enclosure (211)*, which is connected by wires to printed circuit board (254) and to Triac (304). The *second printed circuit board (255)* is mounted in a *second printed circuit board enclosure (211)* and is located on the underside of the heating unit (12). The thermistor (310) is connected by wires to the printed circuit board (254). (Ex. D, ¶ 47).

38. As shown in photos 8-10 and 11-12 (App. C) the West Bend programmable circuit (300) includes two printed circuit boards (254 and *255*), connected by wires as well as components mounted external to the printed circuit boards (254 and *255*). One of the printed circuit boards (254) of the programmable circuit is positioned within the housing. The other

printed circuit board (*255)* is mounted within the heating unit (12). The thermistor (310) and Triac (304) are both mounted externally to the printed circuit boards (254 and *255)*, within the heating unit interior space. (Ex. D, ¶ 48).

39. West Bend's programmable circuit (300) is not entirely within the housing; however, a printed circuit board (254) including electronic components which permit a user to select a cooking time and temperature is positioned within the housing (210). The programmable circuit (300) as a whole, including both printed circuit boards (254 and *255*), the thermistor (310) and Triac (304), works in exactly the same way as the programmable circuit (300) disclosed in the '483 and '855 Patents. The only difference is that some electronic components are located within the heating unit rather than the housing. Splitting the printed circuit board component of the programmable circuit (300) into two circuit boards which are connected by wires is an insubstantial change readily apparent to a person of ordinary skill in the art. The West Bend programmable circuit (300) performs all the claimed functions (selecting a cooking time and temperature and automatically changing the heating element from a cook mode to a warm mode once the set time has expired) in substantially the same way to achieve substantially the same result. Merely splitting one circuit board component of the programmable circuit into two circuit boards connected by wires does not change the function, way, or result of the circuit (300). (Ex. D, ¶ 49).

40. Dr. Feinberg's declaration incorrectly identifies a single component of the programmable circuit (300), namely, a microprocessor controller (302) as the "programmable controller." (Ex. D, ¶ 50).

41. Dr. Feinberg mischaracterizes the *outer housing shell (210B)* as a "control panel," which does not form a part of the circuit board housing (210). The '483 Patent describes the control panel user interface (254) as being located on the front surface of the housing (210) (Ex. A, Figs 5 and 6, and Col 3, lines 20-21). In West Bend's programmable slow-cooker, the control panel user interface (254) is located on the outer surface of *outer housing shell (210B)*. The '483 Patent shows the circuit board housing (254) as an enclosure. The *outer housing shell (210B)*, which Dr. Feinberg identifies as the "control panel" along with the *inner housing shell (210B)*, which he calls the "plastic housing for first circuit board" form the circuit board housing (210) enclosure. The *inner and outer housing shell (210A and 210B)* sections are each affixed by screws to the outer sidewall (18) of the heating unit (12) and enclose the printed circuit board (254) within the housing (210). (Ex. D, ¶ 51).

42. Since Dr. Feinberg starts with the incorrect premise that the programmable controller consists solely of the microprocessor, his conclusion at paragraph 12 of his Declaration that the programmable controller lies "entirely inside the heating unit" is incorrect. Likewise, his statements in paragraph 13 are incorrect since they rely on the incorrect presumption that the microprocessor is the only component of the programmable controller, which is contrary to the teaching in the specification of the '483 and '855 Patents, as well as the Court's claim construction. (Ex. D, ¶ 51).

Respectfully submitted,

SUNBEAM PRODUCTS, INC.,
f/k/a THE HOLMES GROUP
By its Attorneys,

Dated: October 12, 2006

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CERTIFICATE OF SERVICE

I hereby certify that this document filed through the ECF system will be sent electronically to the registered participants as identified on the Notice of Electronic Filing (NEF) and paper copies will be sent to those indicated as non-registered participants on October 12, 2006.

/s/ Glenn T. Henneberger
Glenn T. Henneberger

EXHIBIT A

US006573483B1

(12) **United States Patent**
DeCobert et al.

(10) **Patent No.: US 6,573,483 B1**
(45) **Date of Patent: Jun. 3, 2003**

(54) **PROGRAMMABLE SLOW-COOKER APPLIANCE**

(75) Inventors: **James E. DeCobert**, Attleboro, MA (US); **Lorens G. Hlava**, Clinton, MO (US); **Charles T. Thrasher, Jr.**, Clinton, MA (US)

(73) Assignee: **The Holmes Group, Inc.**, Milford, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/802,174**

(22) Filed: **Mar. 8, 2001**

Related U.S. Application Data

(60) Provisional application No. 60/189,443, filed on Mar. 15, 2000, and provisional application No. 60/196,273, filed on Apr. 5, 2000.

(51) **Int. Cl.**[7] **H05B 1/02**

(52) **U.S. Cl.** **219/506**; 219/494; 219/497; 219/435; 219/432; 99/340

(58) **Field of Search** 219/433, 432, 219/435, 506, 494, 518; 99/340

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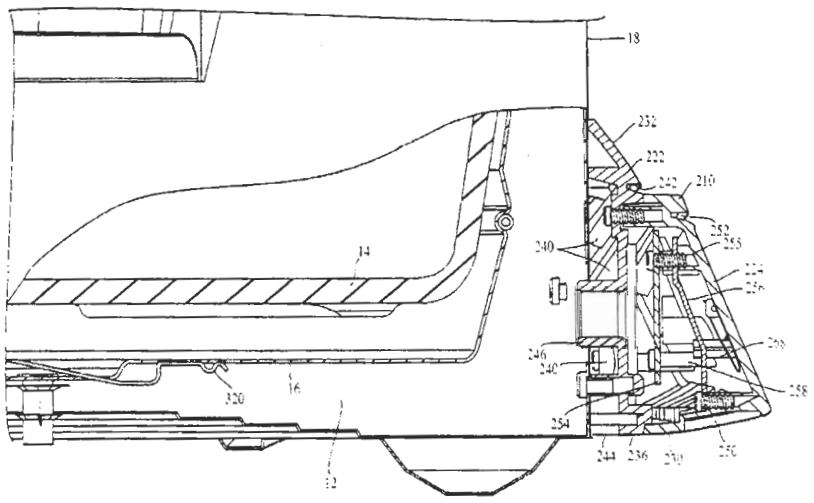
Primary Examiner—Mark Paschall
(74) *Attorney, Agent, or Firm*—Brinks Hofer Gilson & Lione

(57) **ABSTRACT**

A programmable slow-cooker appliance, in which a user sets a time and temperature for cooking a food item. A programmable controller prevents the unit from being used solely as a "keep warm" appliance, and a unique design allows cooling of the controller during cooking.

19 Claims, 12 Drawing Sheets



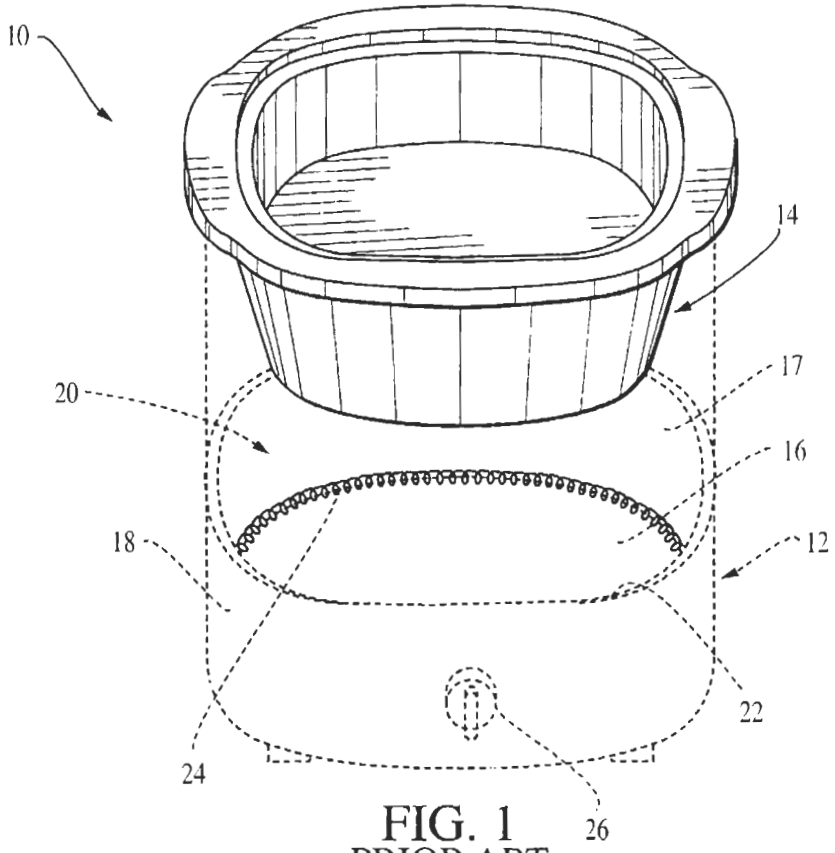


FIG. 1
PRIOR ART

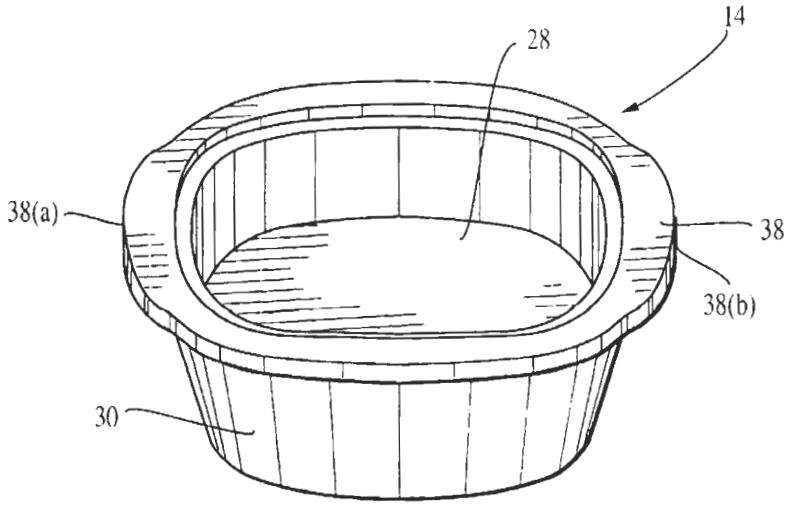


FIG. 2
PRIOR ART

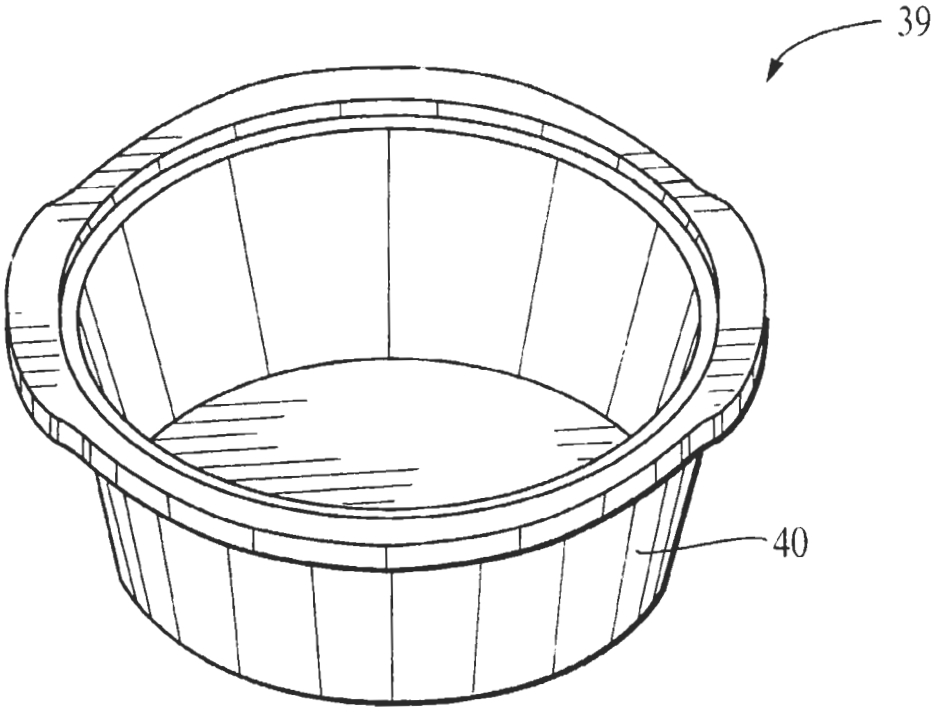


FIG. 3
PRIOR ART

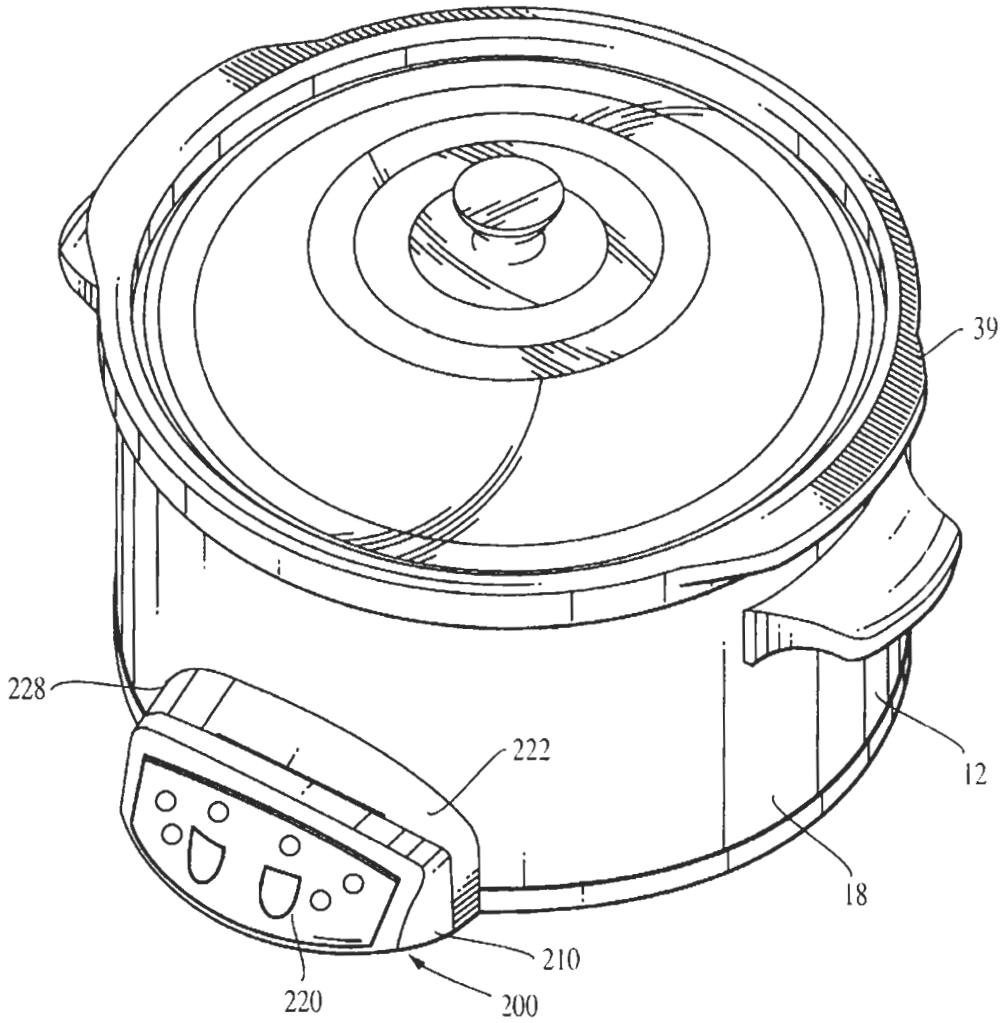
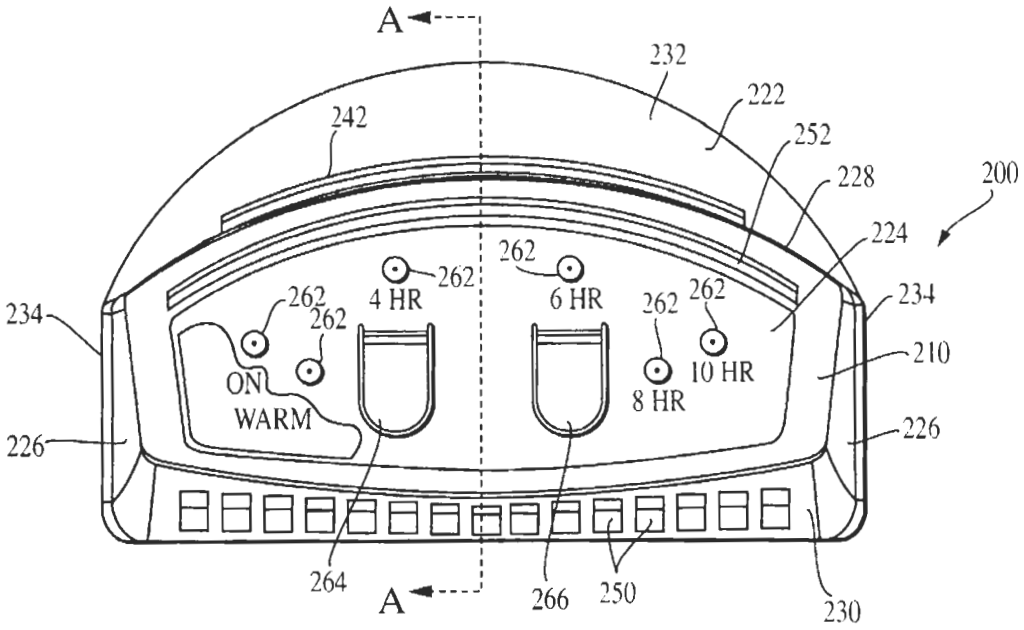


FIG. 4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262
262
ON
WARM
8 HR
10 HR
210
226
226
264
A
266
250
230

FIG. 5

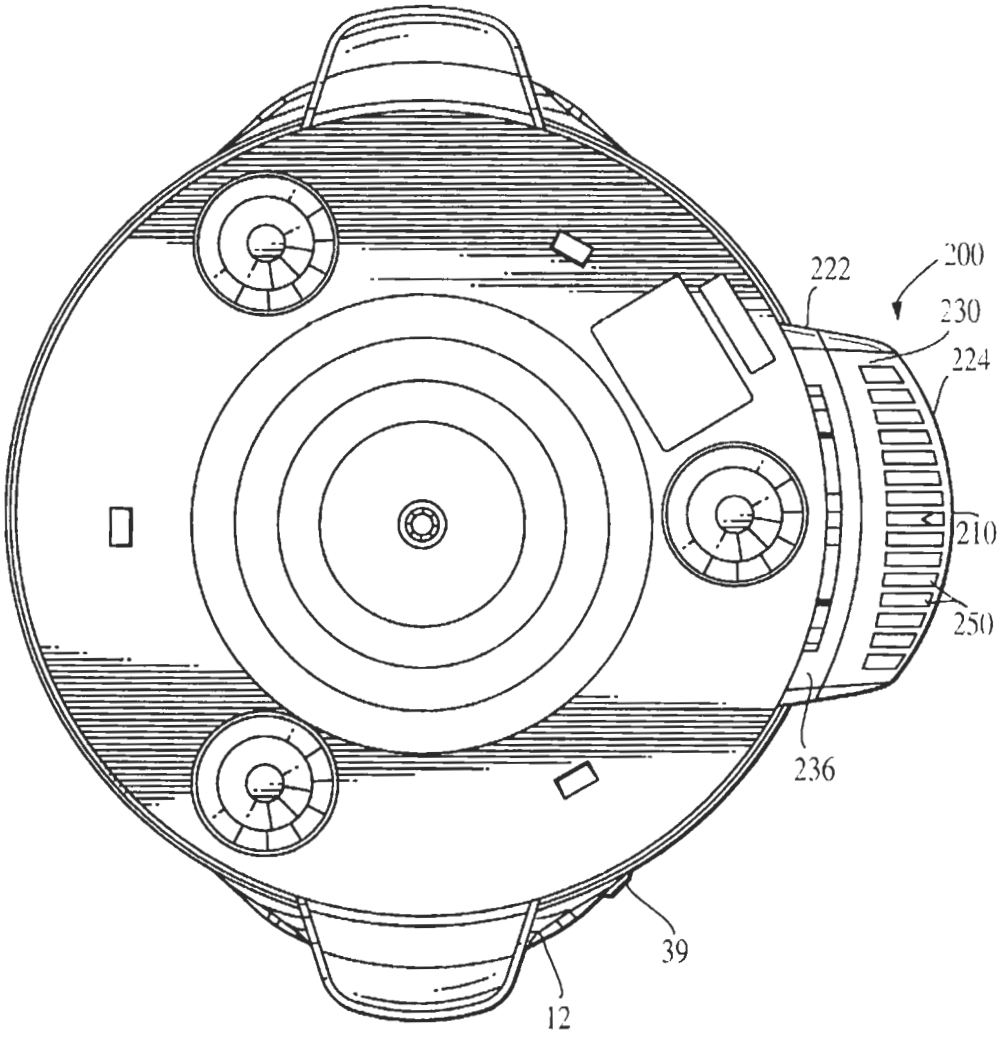

FIG. 6

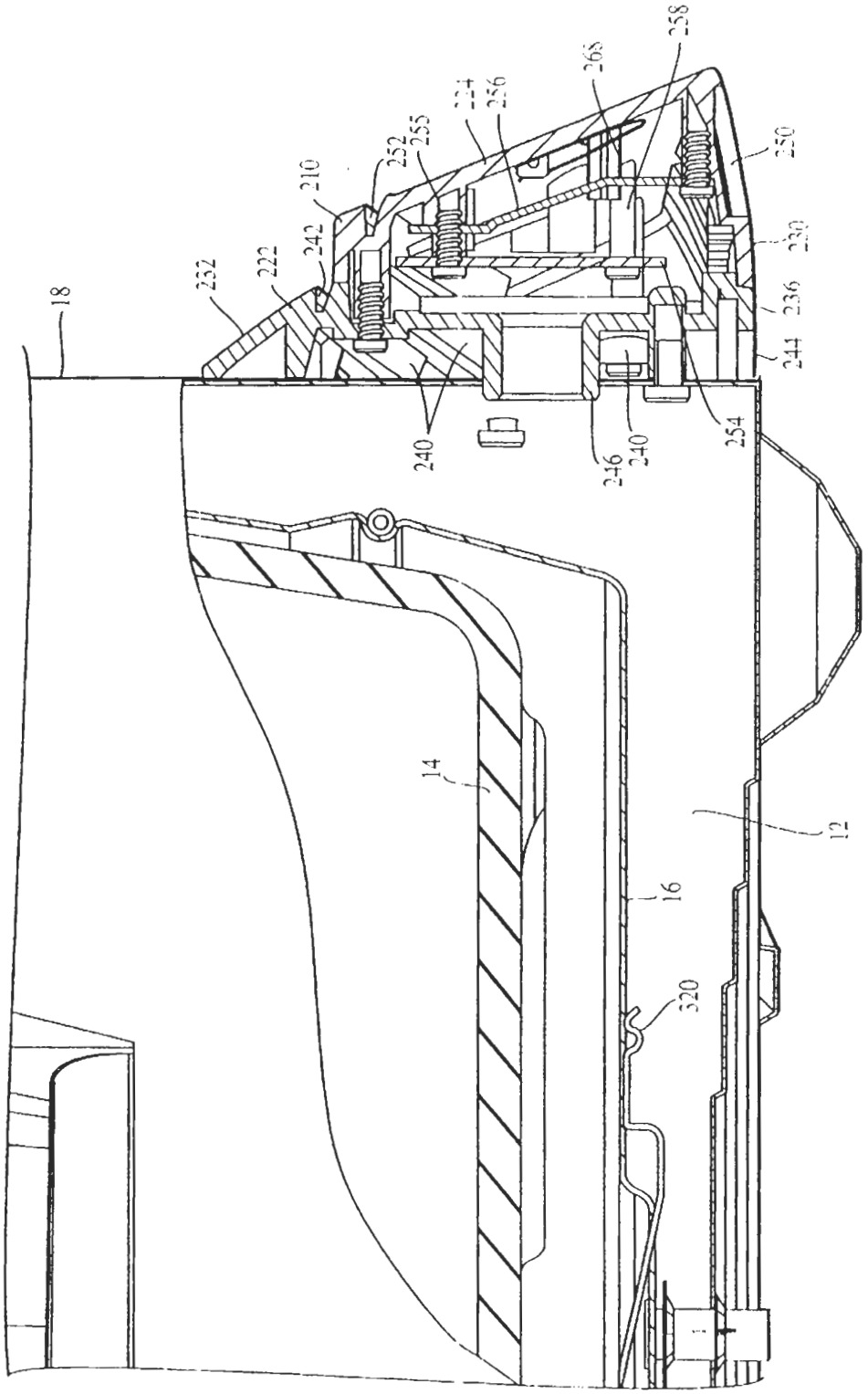
18
232
222
242
210
252
255
234
256
268
258
250
230
236
244
240
246
240
254
14
12
16
320

FIG. 7

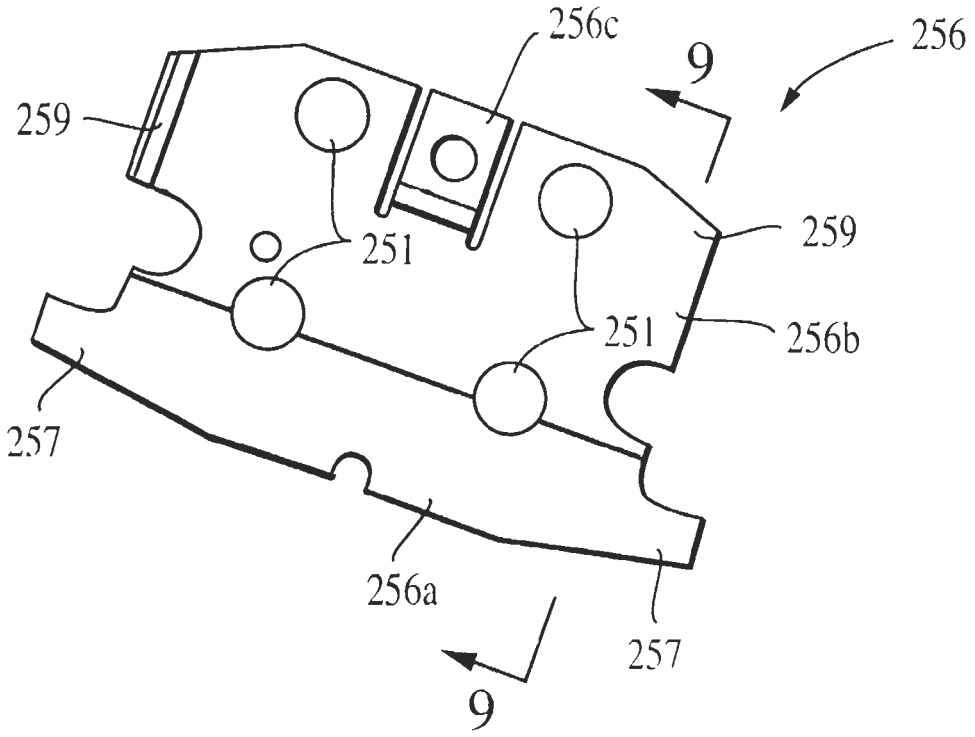

FIG. 8

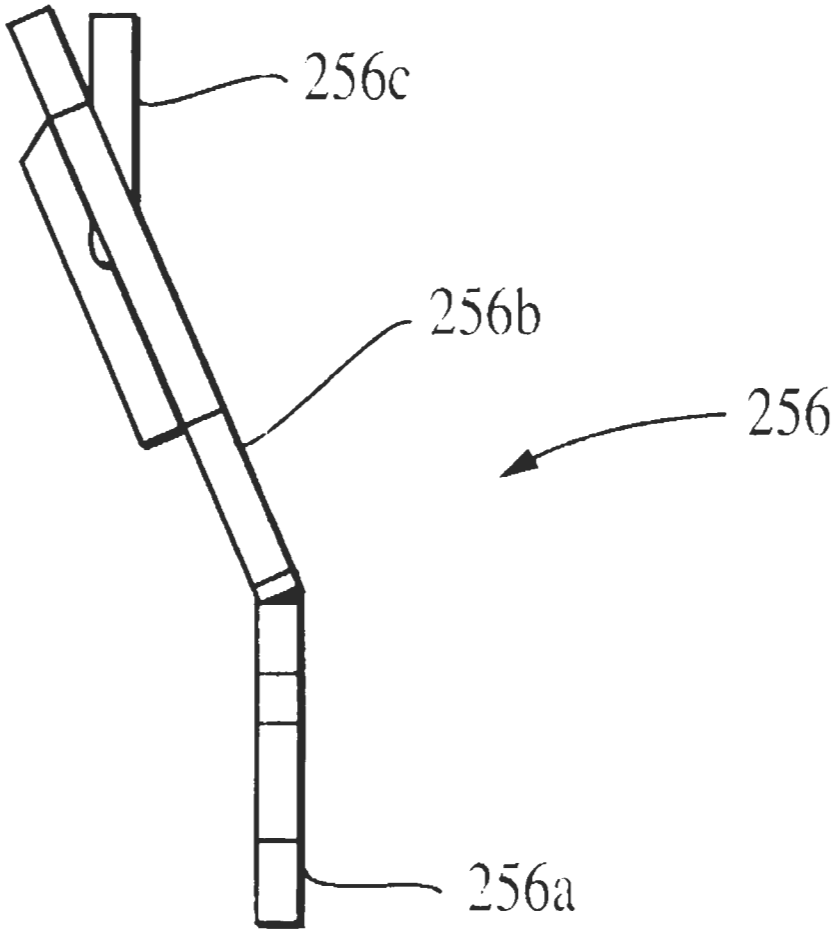

FIG. 9

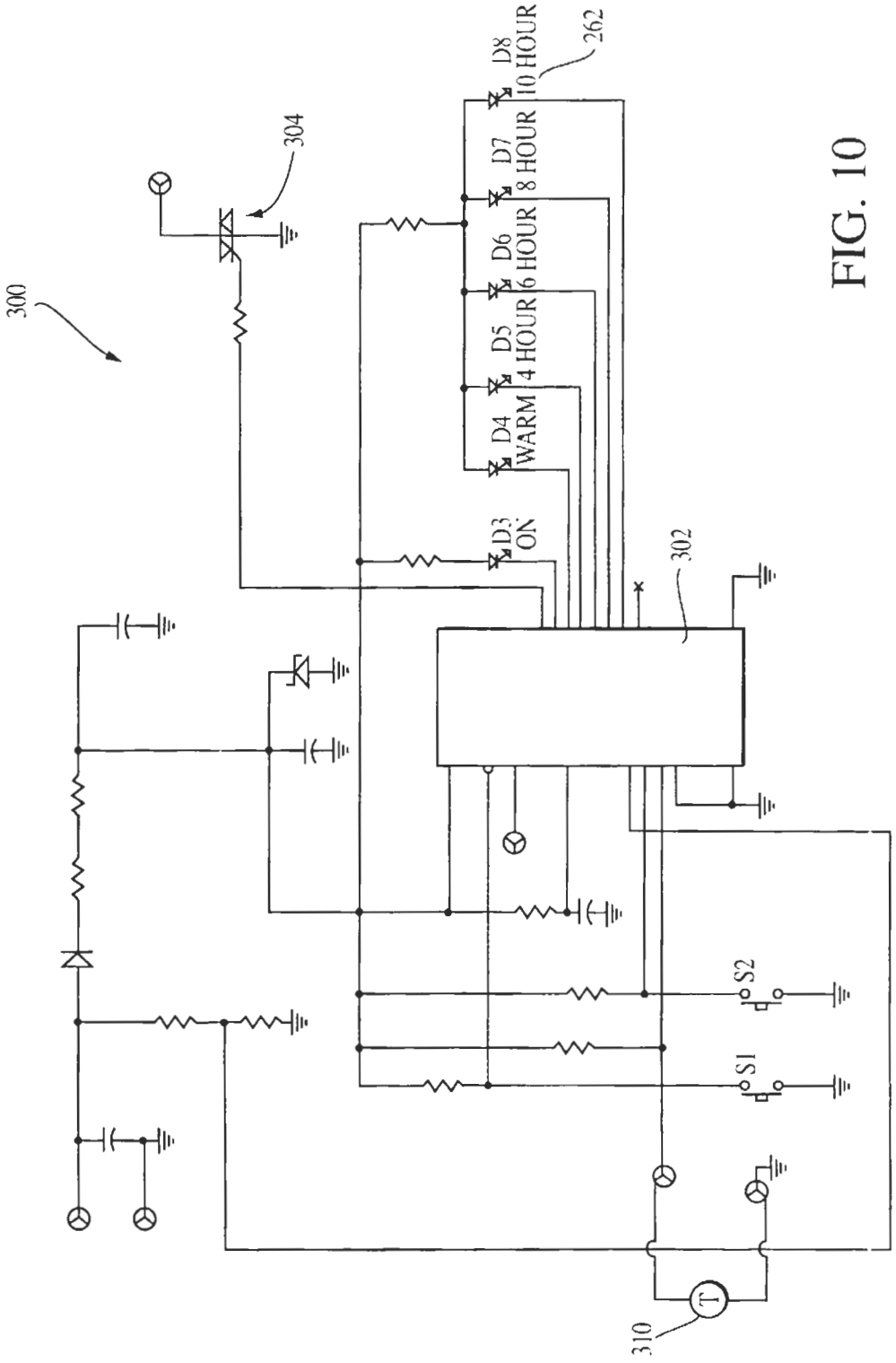
300
304
D8
10 HOUR
262
D7
8 HOUR
D6
6 HOUR
D5
4 HOUR
D4
WARM
D3
ON
302
S2
S1
T
310

FIG. 10

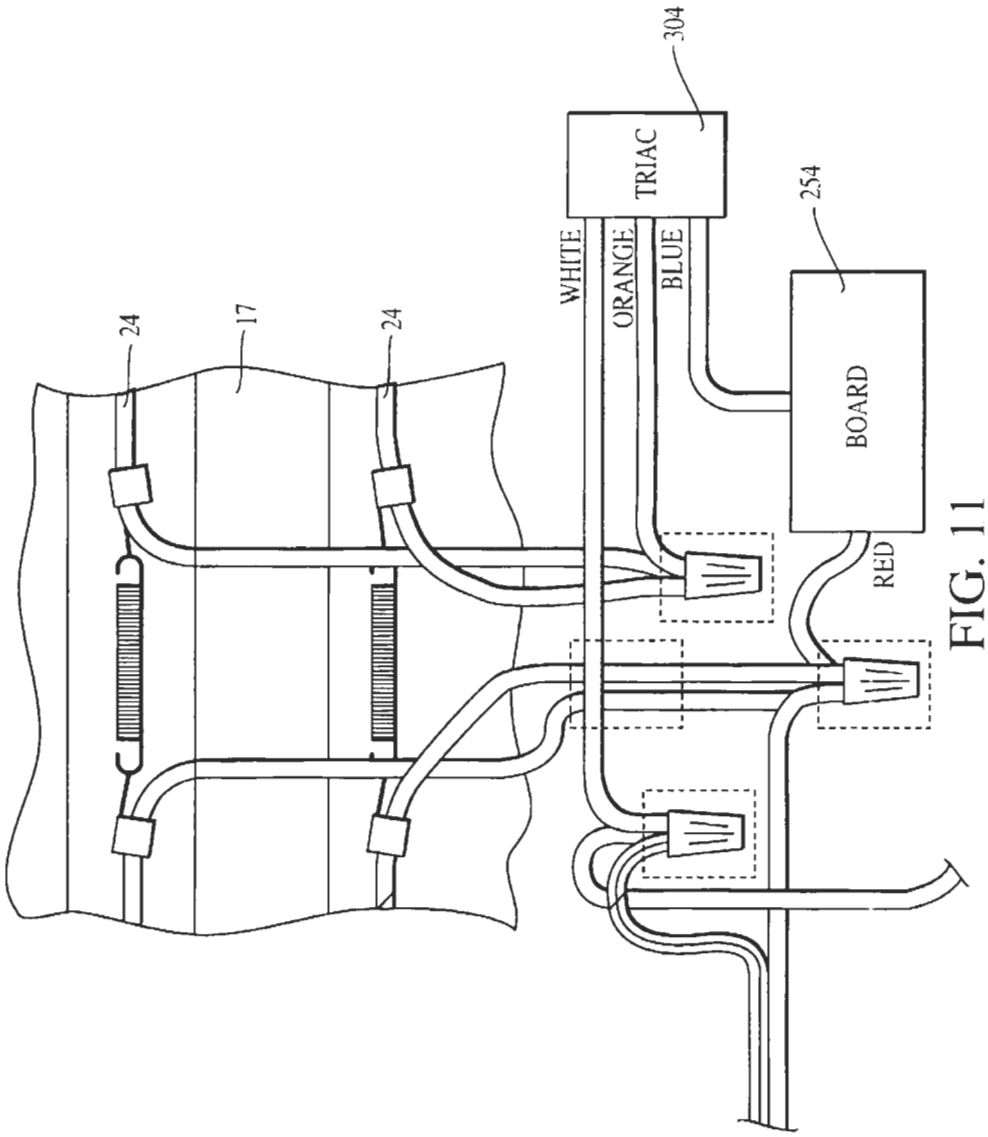

FIG. 11

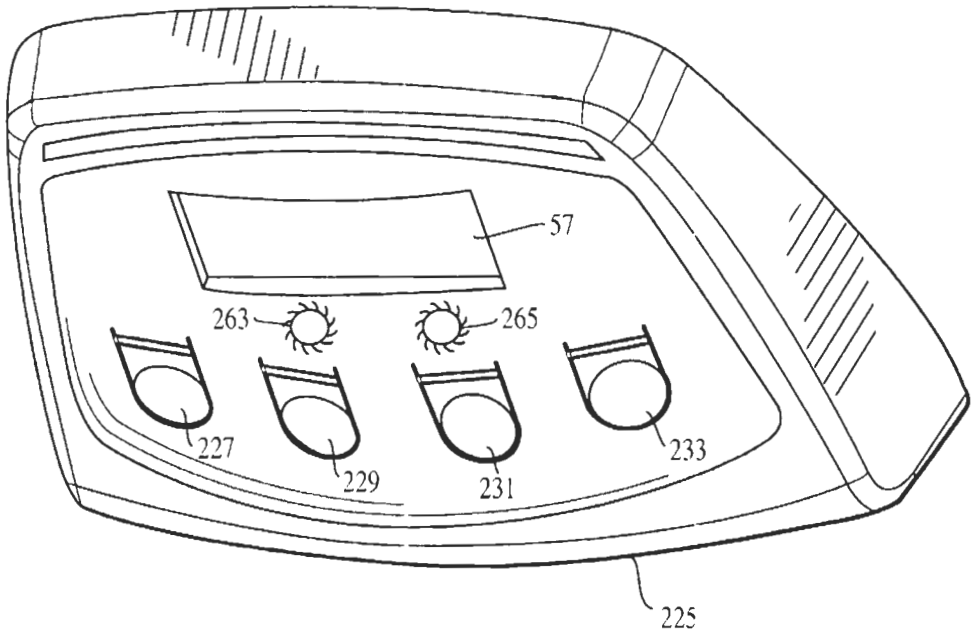

FIG. 12

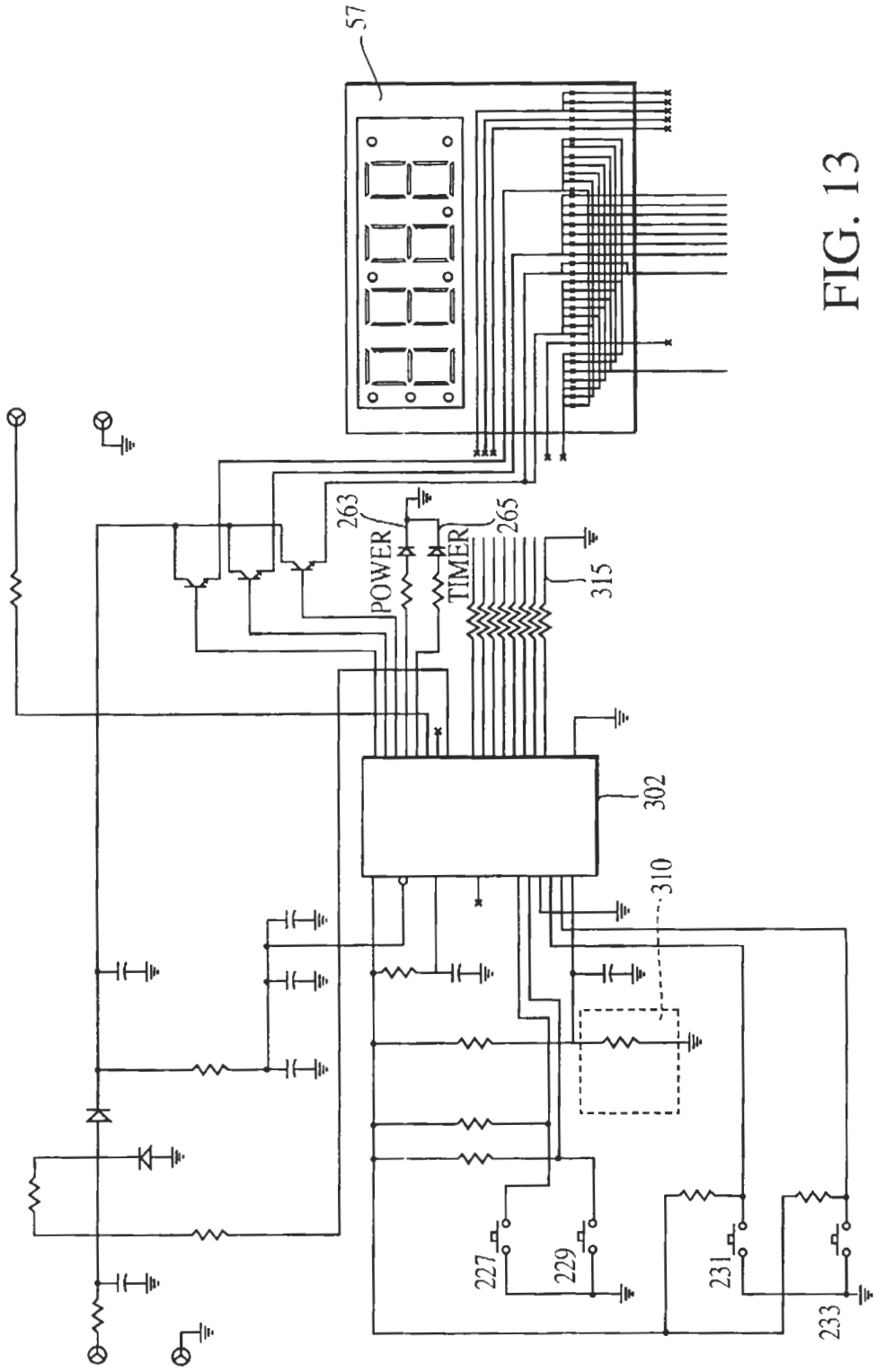

FIG. 13

PROGRAMMABLE SLOW-COOKER APPLIANCE

This application claims priority to Provisional Application No. 60/189,443, filed Mar. 15, 2000, and to Provisional Application No. 60/196,273, filed Apr. 5, 2000.

BACKGROUND OF THE INVENTION

Time and convenience are in short supply for homemakers wishing to supply a home-cooked meal to family members. Some appliances, such as slow-cooker appliances, attempt to meet this need by providing all-day cooking while a homemaker is absent. Such appliances, however, tend to be of the type where only one temperature and all day cooking is possible, regardless of the food item, and thus potentially subjecting the food item to over- or under-cooking. Another option may be to use a cooking unit with a controller, where a user may set a time or temperature desired. These units, however, tend to be quite a bit larger and more expensive than slow-cooker appliances. If these units are of more reasonable size, they also suffer because the controller inevitably must be placed near the heating element.

What is needed is a cooking appliance in which the user retains control over the time and temperature of cooking, but which is small enough to be convenient. What is needed is a slow-cooker unit in which the controller does not become overheated and damaged by the heating element.

SUMMARY OF THE INVENTION

One embodiment of the invention is a programmable slow-cooker appliance, including a heating unit, which includes upstanding sidewalls and a bottom wall. The sidewalls and bottom encompass a heating area. The appliance includes a heating element mounted on the inner surface of the interior wall of the heating unit. In one embodiment, the cooking area may also encompass a cooking unit inside the heating unit, suitable for holding food to be cooked. The appliance includes a programmable controller mounted on its outside, and preferably mounted via a controller housing, which acts to insulate the controller from the heat of the appliance, preferably via a unique system of a heat sink and ventilation. The housing, on the side of the slow-cooker appliance, utilizes ventilation holes on its bottom and top to encourage a chimney effect, in which cool air from the surroundings is drawn into ventilation slots or holes at the bottom of the housing. This air cools the controller, and the air is then expelled from ventilation holes on the top of the housing, convecting heat away from the controller.

Another aspect of the invention is a method of using the programmable controller to ensure that food is cooked according to the desires of a user. The user provides a food item and places the food item into the slow-cooker appliance, as described above. The user sets a cooking time and temperature for the programmable slow-cooker unit, using the controls to set both the time and the temperature. The cooking time according to one embodiment may not be set less than four hours, and the temperature may not be set for less than 150 degrees Fahrenheit (66 degrees Celsius). This prevents a user from accidentally setting the cooker to a "warm" temperature, in which food would only be warmed but not cooked thoroughly before consumption. In one embodiment, if the user sets no time or temperature, but merely turns the cooker on, the cooker defaults to a particular time and temperature, set by the user or the factory, such as a default setting of four hours and 175 degrees Fahrenheit or eight hours and 150 degrees Fahrenheit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an embodiment of a prior art slow-cooker appliance having an oval shape that may be utilized in the present invention;

FIG. **2** is a perspective view of a prior art embodiment of a cooking unit **14** which may be utilized with the appliance of FIG. **1**;

FIG. **3** is a perspective view of a prior art cooking unit **39** similar to that shown in FIG. **2**, but having a circular shape;

FIG. **4** is a perspective view of a slow cooker appliance incorporating the present invention;

FIG. **5** is a detailed plan view of a portion of the control **200** of the embodiment of FIG. **4**;

FIG. **6** is a bottom plan view of the embodiment of FIG. **4**;

FIG. **7** is a side cutaway view of the embodiment of FIG. **4**;

FIG. **8** is a plan view of a heat sink **256** as utilized in the embodiment of FIG. **4**;

FIG. **9** is a side view taken along a line **9**—**9** of FIG. **8**;

FIGS. **10** and **13** are schematic circuit diagrams showing the circuitry and components implemented in preferred embodiments;

FIG. **11** is a wiring diagram showing some of the electric componentry of the preferred embodiment; and

FIG. **12** is an embodiment of the front panel.

DETAILED DESCRIPTION OF THE DRAWINGS AND PREFERRED EMBODIMENTS

Referring to FIG. **1**, one prior art embodiment of a food-heating slow-cooker appliance **10** is shown. The appliance **10** preferably comprises a heating unit **12** and a cooking unit **14**. An exemplary slow cooker appliance **10** may be a Crock-Pot® Slow Cooker made by The Rival Division of The Holmes Group® of Milford, Mass. The heating unit **12** preferably has a bottom **16** and a continuous outer sidewall **18**. The bottom **16** and an interior sidewall **17** define a well-like heating chamber **20** having an oval cross-section, and the interior sidewall **17** defines an annular lip **22** at an upper edge of the outer sidewall **18** and the interior sidewall **17**. The heating chamber **20** has a heating element **24** disposed therein and mounted to the heating unit **12**, either under the bottom **16** or additionally between the outer sidewall **18** and the interior sidewall **17**. A control switch **26** is conventionally used to provide electricity to the heating element **24**. The heating element **24** functions to heat the cooking unit **14** via the heating chamber **20**.

As shown in FIG. **2**, the cooking unit **14** has a bottom **28** with preferably a continuous sidewall **30** upstanding therefrom. The continuous sidewall **30** preferably has an annular lip **38** projecting in flange-like fashion from the upper end thereof and a substantially oval cross-section. The cooking unit **14** is adapted to be at least partially received within the heating unit **12** with the annular lip **38** of the cooking unit **14** preferably engaging the annular lip **22** of the heating unit **12**, supporting the cooking unit **14** within the heating unit **12**. Preferably, the annular lip **38** further defines a pair of handle portions **38**(*a*) and **38**(*b*) to facilitate lifting the cooking unit **14**. The cooking unit **14** is preferably made of ceramic with a coating of conventional glazing compound.

The thermal and heat retaining properties of the ceramic cooking unit **14** allow it to conduct heat from the heating chamber **20** through the sidewall **30**. This provides even heating throughout the unit **14**.

As shown in FIG. **3**, an alternative embodiment of the appliance **10** includes a cooking unit **39** having a sidewall **40** and a substantially circular cross-section. This embodiment is preferably adapted to fit within a heating unit having a complementary circular heating chamber. This cooking unit **39** is used in an embodiment of the present invention shown in FIG. **4**.

In use, the heating unit **12** is provided with a first cooking unit **39**. The heating element **24** (not shown) may be powered on and off as necessary to supply heat at a maintained temperature to the cooking unit **39** and the heating chamber via a programmable control **200**. The control **200** preferably includes a circuit board housing **210**, a control panel **220**, and an insulation shield **222** assembled together for attachment to the outer sidewall **18** of the heating unit **12**. The interior of the housing **210** contains a printed circuit board **254** (shown in FIG. **7**) containing electronic components of the control.

As shown in FIGS. **5** and **6**, the housing **210** preferably includes a control panel user interface **224** located on an inclined front surface of the housing **210**. Preferably, the housing **210** and insulation shield **222** are made from a thermoplastic material such as polypropylene. A pair of side walls **226**, a top wall **228**, and bottom wall **230** are preferably located adjacent the control panel **224** and support the control panel **224** in an inclined position away from the front of the cooking appliance **10**. This gives the user access to the control panel **224**, and also locates the controls and componentry within the housing **210** away from a significant amount of the heat generated by the appliance **10**. The printed circuit board **254** may be mounted via threaded screws **255** to rearwardly projecting screw receiving portions **258** on the rear side of the housing **210**.

The control panel **224** includes a plurality of indicator lights, such as LEDs **262**, spaced on the front panel **224**. As is well-known in the art, a variety of other indicator devices may be provided, including digital readouts, audible alarms, liquid crystal displays, incandescent lamps or fluorescent readouts. Preferably, the control panel **224** also includes a plurality of cantilevered portions **264** and **266** as shown in FIG. **5**. The cantilevered portions **264**, **266** preferably include rearwardly projecting fingers **268** (shown in FIG. **7**) which translate the depression of the portions **264**, **266** toward the rear portion of the housing **210**. The fingers **268** are preferably used to depress pushbutton switch portions located on the circuit board **254**. A water-impermeable label membrane may be applied over the front of the control panel **224** to label the indicators **262** and cantilevered portions **264** and **266** for the user. The membrane may also protect the front control panel **224** from damage from spilled foods or liquids and facilitate cleaning.

To further protect the electronic componentry within the housing **210** from the heat generated by the appliance **10**, the annular shield member **222** is preferably sized for interposition between the heating unit **12** and the housing **210**. In particular, as shown in FIGS. **5** and **6**, the shield **222** includes a top wall **232**, a pair of side walls **234**, and a bottom wall **236**. The shield **222** acts as a ventilated spacer to hold the electronic components and the housing **210** at a distance away from sidewall of the cooking unit **12**.

In order to dissipate heat that may otherwise be retained between the cooking unit **12** and the rear of the housing **210**, an air circulation space is provided within the shield. In particular, as shown in the side cutaway view of FIG. **7**, the air space **240** behind the shield **222** may vent warmer air out through an upper elongated slot **242** defined within the top wall **232** of the shield **222**. Likewise, an elongated slot **244** is defined into the air space **240** in the bottom wall **236** of the shield **222**. Heated air may thus escape through the top elongated slot **242** and cooler air may enter the air space **240** through the bottom elongated slot **244**. As shown in FIG. **7**, the shield **222** also preferably defines a rearwardly projecting cylindrical flange **246** that extends into the outer wall **18** to allow passage of control and power wiring between the interior of the heating unit **12** and the interior of the housing **210**.

In a similar fashion, air circulation is promoted through the housing **210** through a set of openings, preferably defined between the upper portion and the bottom of the housing **210**. In particular, a plurality of openings **250** are defined within the bottom wall **230** of the housing **210**. An elongated upper slot **252** is provided on the front face **224** of the housing **210**. This allows air to freely circulate behind the control panel **224** and assist in the dissipation of heat from the circuit board **254** and its electronic componentry within the housing **210**. Preferably, a heat sink **256** is provided as shown in FIG. **7** and positioned between the circuit board **254** and the front panel **224** inside the housing **210**. The sink **256** preferably includes a plurality of openings defined therein to allow air to circulate between the openings **250** and **252** and through and around the heat sink **256** to dissipate additional heat therefrom. Also shown is the relative position of cooking unit **14**.

FIGS. **8** and **9** show a detailed view of the heat sink **256**. Preferably, the heat sink is machined from 0.063 inch thick 3003-0 anodized aluminum. The heat sink **256** is preferably bent at a 160 degree angle between a bottom flange portion **256***a* and an upper portion **256***b*. A centrally located retaining tab portion **256***c* is bent parallel with the lower portion **256***a*, and the portions **256***a* and **256***c* are used for attachment of the heat sink **256** to the rear side of the housing **210** interior via the rearwardly projecting screw receiving portions **258**. To maximize the dissipation of heat, a plurality of winged sections **257** and **259** are provided on the heat sink **256** and extend outwardly from a center portion **256***a* of the heat sink **256**. A plurality of openings are defined through the heat sink **256** to allow the fingers **258** of the control panel cantilevered portions **264**, **266** to project through the heat sink and contact the circuit board **254** at the rear of the housing **210**. The openings **251** also facilitate cooling air flow through and past the heat sink **256** to further dissipate heat therefrom.

The circuit board **254** mounts circuitry and logic allowing the user of the appliance **10** to electronically control and program cooking cycles and temperature. A schematic diagram of the electronic circuitry and components is shown in FIG. **10**. The diagram shows a preferred exemplary circuit incorporating preferred components as utilized in the preferred embodiment of the present invention. One skilled in the art will recognize that the componentry illustrated herein is exemplary only and that many other components may be substituted to achieve the functions described herein. FIG. **10** includes labels for each of the components of the circuit, and only major components will be described herein.

First, as shown in the diagram, the preferred circuit **300** is preferably built around an EPROM/ROM-based CMOS microprocessor controller **302**, such as the PIC16CR54C RISC CPU manufactured by Microchip Technology, Inc. The chip output preferably includes circuited drivers for 6 LED indicators **262** (labeled D3–D8) as shown. These LED indicators may be assigned labels as follows:

LED	Indicates
D3	On
D4	WARM
D5	4 HOUR
D6	6 HOUR
D7	8 HOUR
D8	10 HOUR

Two momentary pushbutton contact switches S1 and S2 are used to trigger the "Off" and "Cook" features, respectively, as will be described in the cooking procedure below. Of course, other indicators and switches may be substituted. Note that while examples are given, the circuitry may be implemented in numerous ways, as is well-known in the art, to accomplish the varying programming modes described below.

The temperature of the cooking appliance is measured using a thermistor **310**, which is connected externally of the circuit board to the underside of the bottom of the heating chamber. A retention clip **320**, shown in FIG. **7**, is utilized to hold the thermistor in thermal contact with the bottom **16**. In a preferred embodiment, the appliance uses a model USX1732 thermistor manufactured by U.S. Sensor, Inc.

Triac **304**, which is preferably a logic Triac Model L4008L6-ND manufactured by Digi-Key, Inc., is utilized to switch the power supplied to the heating elements of the appliance. Preferably, the Triac is of an isolated tab type and includes a heat sink tab that is fastenable to the heat sink **256** shown in FIGS. **8** and **9**. Preferably, the Triac is mounted separately to one of the mounting holes on the center portion **256***a* of the heat sink **256** so that the tab is in thermal contact with the heat sink **256** to dissipate heat generated from its current controlling function. Most of the other components of the circuit **300** are mounted on a conventional printed circuit board **254**.

FIG. **11** shows the wiring of the external Triac **304** in relation to the circuit board **254** and heating elements **24**. As shown in the Figure, the heating elements **24** are in thermal contact with and wrapping around the interior sidewall **17** of the heating unit.

The operation of the appliance **10** is as follows. The programmable circuitry **300** allows the user to set both the temperature and desired time for cooking. The functions of the switches S1 and S2, which are activatable via the cantilevered portions **264** and **266** of the control panel **224**, are as follows:

S1. OFF pushbutton—turns the appliance **10** off.

S2. COOK pushbutton—subsequent pushes of the button cycle through 4 hour, 6 hour, 8 hour and 10 hour cook times.

When the unit is plugged in, the power "on" indicator flashes. The user then pushes the COOK button (switch S2) to set the temperature and cooking time. As the user pushes the COOK switch S2, the LED's D5–D8 illuminate to indicate the corresponding time setting as follows.

LEDs

D3. POWER—on when appliance **10** is in cook or warm modes.

D5. 4 HOUR—on when appliance is in 4-hour cook mode

D6. 6 HOUR—on when appliance is in 6-hour cook mode

D7. 8 HOUR—on when appliance is in 8-hour cook mode

D8. 10 HOUR—on when appliance is in 10-hour cook mode

D4. WARM—on when appliance is in half-power mode Thus, subsequent pushes of the COOK switch S2 activate different cooking modes, as shown by the 6 HOUR, 8 HOUR and 10 HOUR LEDs **262** on the control panel **224**. If the COOK switch S2 is pressed in the 10 HOUR mode, the control **200** recycles to the 4 HOUR cooking mode, and its indicator.

In general, full power will be applied to the heating element **24** until the time corresponding to the illuminated LED elapses, after which the power to the heating element **24** is reduced by half, the WARM indicator illuminates and all cook time indicators extinguish. The choices of operation are: 4 or 6 hours on a HI temperature, and 8 to 10 hours on a lower temperature setting. Once the user selects the desired setting, the appliance **10** starts the cooking operation. Once the time setting has expired, the appliance **10** automatically reduces power to the heating element **24** to put the unit in a WARM setting. The unit will stay in the WARM setting until the user pushes the OFF button or unplugs the unit. Of course, other programming schemes are possible.

Preferably, the user cannot set the unit initially in the WARM setting. The system will only go to WARM after one of the time functions has expired. This avoids possible food safety problems that may be associated with cooking food only on the WARM setting. Pressing the OFF switch S1 any time the unit is on preferably removes power from the heating element **24** and extinguishes all indicator LEDs **262**.

In another embodiment, the slow-cooker appliance utilizes four push-button switches, rather than two, to set times and temperatures for cooking. An exemplary control panel is depicted in FIG. **12**, with control circuitry in FIG. **13**. Four momentary pushbutton contact switches **227, 229, 231, 233** are used to trigger various power and setting functions as will be described in the cooking procedure below. Of course, other numbers or types of indicators and switches may be substituted as well. FIG. **13** shows circuitry applicable to such an embodiment, incorporating controller **302**, external temperature element **310**, digital readout **57**, and Power LED **263** and Timer LED **265**. The Power LED indicates power is present at the microprocessor controller and the Timer LED indicates that the Timer function is on and working.

The operation of the appliance is as follows. The programmable circuitry allows the user to set both the temperature and the desired cooking time. The functions of the switches **227, 229, 231, 233** on an alternative embodiment of a control panel user interface **225**, are as follows:

227. ON/OFF power pushbutton—turns the appliance on and off.

229. TIMER pushbutton—activates stepped timer.

231. UP pushbutton—increases displayed numerical value.

233. DOWN pushbutton—decreases displayed numerical value.

When the unit is plugged in, the unit defaults to 150-degrees F. as shown on the digital display **57**. The user may adjust the desired cooking temperature in 25-degree increments using the UP **231** button or the DOWN button **233**, with 150 degrees Fahrenheit as a minimum temperature. Once the user has selected the specific temperature, the appliance will start the cooking process.

The user may also select the TIMER mode by pressing the TIMER button **229**. In TIMER mode, the controller defaults to 4 hours. The user can use the UP or DOWN controls to increase or decrease the time in 15-minute increments. Once the time is set, the controller **302** will count down the time remaining for cooking in 1 minute increments until the unit

"times out". At that time, the power is shut off from the heating element.

In all modes, the temperature is read periodically by the thermistor or other temperature element and relayed to the controller. The reading is checked at 4-second intervals. If the temperature is above or equal to the set point, power is removed. If it is below the set point, power is applied to the heating element **32**. Of course, the circuitry can be modified as desired to achieve various program methods and modes.

Another embodiment of the slow cooker appliance adds a piezobuzzer to the circuitry. A piezobuzzer is simply an electrically-activated buzzer that can be programmed to emit a sound at desired moments. In one embodiment, a piezobuzzer may be installed as an output **315**, controlled by the microprocessor controller **302**, as shown in FIG. **13**, and programmed to emit a sound when desired. In one embodiment, the buzzer may beep to provide feedback to a user when a pushbutton is pushed. The slow cooker may also be programmed to emit a sound to indicate the end of the cooking time. The buzzer may also be used to emit sounds at other desired times.

It is intended that the foregoing description illustrates rather than limits this invention, and that it is the following claims, including all equivalents, which define this invention. Of course, it should be understood that a wide range of changes and modifications may be made to the embodiments described above. Accordingly, it is the intention of the applicants to protect all variations and modifications within the valid scope of the present invention. It is intended that the invention be defined by the following claims, including all equivalents.

What is claimed is:

1. A programmable slow-cooker appliance, comprising:

a heating unit;

a cooking unit adapted to fit at least partially within the heating unit;

a controller housing fixedly mounted to an outside of the heating unit; and

a programmable controller mounted to the housing to control the heating unit, wherein said housing is configured to convect heat away from the controller.

2. The slow-cooker appliance of claim **1**, wherein the housing is an enclosure for at least a portion of the controller.

3. The slow-cooker appliance of claim **2**, wherein the controller housing insulates the controller from the heating unit.

4. The slow-cooker appliance of claim **3**, wherein the housing further comprises a heat shield, and the heat shield is made from a material selected from at least one of thermoplastics and insulating materials.

5. The slow-cooker appliance of claim **4**, wherein the housing defines ventilation openings configured to allow air to flow into and out of said housing.

6. The slow-cooker appliance of claim **5**, wherein the housing includes at least a pair of slots defined in an upper and lower part of the housing to define airflow thru the slots and behind the controller.

7. The slow-cooker appliance of claim **1**, wherein the controller further comprises control elements and a display.

8. The slow-cooker appliance of claim **7**, wherein the control elements are selected from the group consisting of a control panel, push-buttons, switches, and a digital readout.

9. The slow-cooker appliance of claim **1**, further comprising a temperature measuring device in communication with said controller.

10. The slow-cooker appliance of claim **1**, further comprising a piezobuzzer.

11. A control housing for a slow cooker heating unit, said housing comprising:

a front wall;

a bottom wall defining at least one lower opening, the bottom wall attached to the front wall;

a top wall defining at least one upper opening, the top wall attached to the front wall; and

a circuit board mounted behind the front wall, the circuit board apart from a wall of the heating unit.

12. The control housing of claim **11**, further comprising a heat sink between the circuit board and the front wall.

13. A method of using a programmable slow-cooker appliance, the method comprising:

providing a food item;

placing the food item into a cooking unit of the slow-cooker appliance;

selecting a cooking temperature and time using a programmable controller mounted to a housing fixedly mounted to a heating unit; and

changing the heating unit temperature automatically to a lower temperature after the selected time.

14. The method of claim **13**, further comprising notifying a user with illuminated indicators that the slow-cooker appliance is powered and that the timer is active.

15. The method of claim **13**, wherein the temperature is set by default upon selection of a cooking time.

16. The method of claim **13**, wherein the time is selected from the group consisting of 4 hours, 6 hours, 8 hours and 10 hours and the temperature is selected from the group consisting of high and low.

17. The method of claim **13**, wherein the temperature and time are set in increments.

18. The method of claim **13**, further comprising cooling the electronic circuitry of the programmable controller via a chimney effect.

19. The method of claim **13**, further comprising emitting a sound.

* * * * *

EXHIBIT B

US006740855B1

(12) **United States Patent**
DeCobert et al.

(10) **Patent No.: US 6,740,855 B1**
(45) **Date of Patent: *May 25, 2004**

(54) **PROGRAMMABLE SLOW-COOKER APPLIANCE**

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(73) Assignee: **The Holmes Group, Inc.**, Milford, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/386,276**

(22) Filed: **Mar. 11, 2003**

Related U.S. Application Data

(63) Continuation of application No. 09/802,174, filed on Mar. 8, 2001, now Pat. No. 6,573,483.
(60) Provisional application No. 60/196,273, filed on Apr. 5, 2000, and provisional application No. 60/189,443, filed on Mar. 15, 2000.

(51) **Int. Cl.**[7] **H05B 1/02**
(52) **U.S. Cl.** **219/506**; 219/429; 219/435; 219/436; 219/494; 99/340
(58) **Field of Search** 219/506, 494, 219/497, 501, 505, 430–439, 429; 99/340

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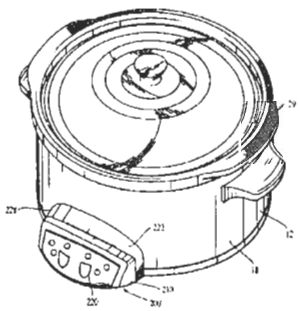
Primary Examiner—Mark Paschall
(74) *Attorney, Agent, or Firm*—Hoffmann & Baron, LLP; Francis E. Marino

(57) **ABSTRACT**

A programmable slow-cooker appliance, in which a user sets a time and temperature for cooking a food item. A programmable controller prevents the unit from being used solely as a "keep warm" appliance, and a unique design allows cooling of the controller during cooking.

42 Claims, 12 Drawing Sheets



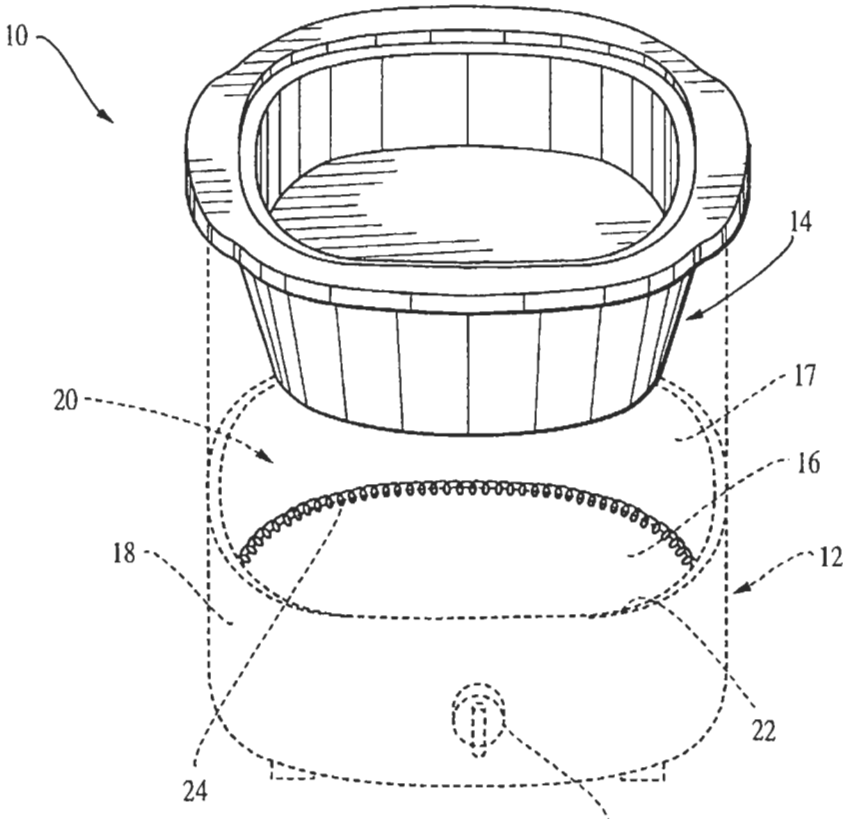


FIG. 1
PRIOR ART

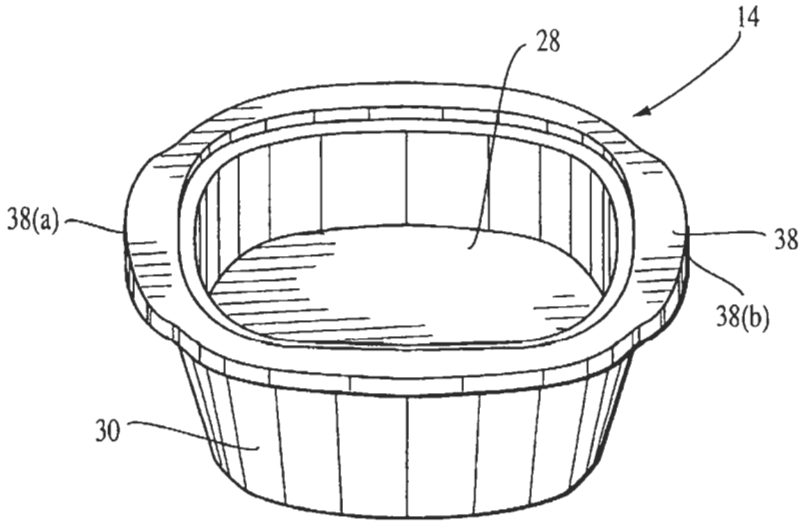


FIG. 2
PRIOR ART

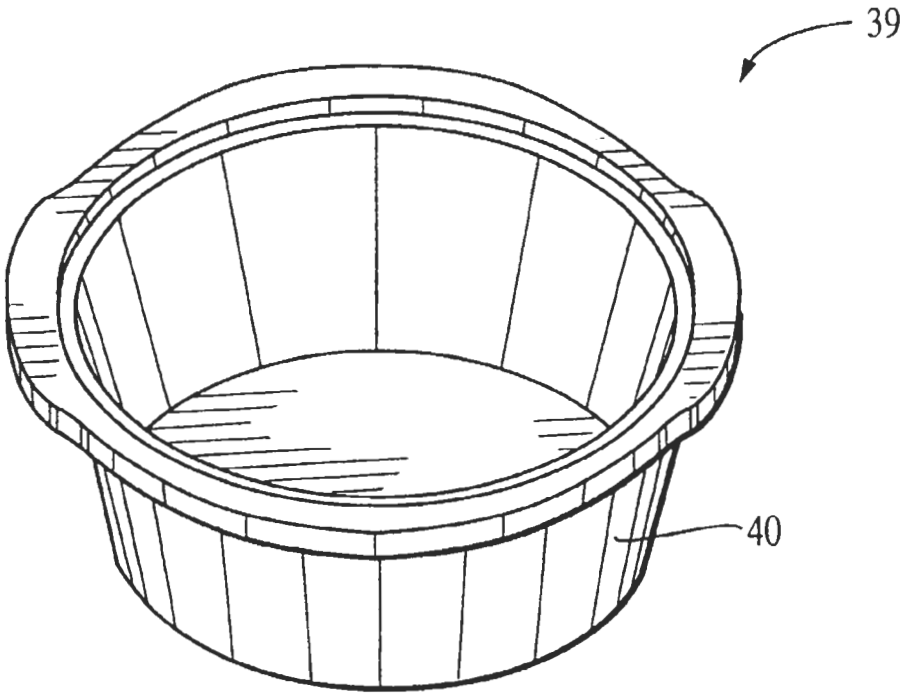


FIG. 3
PRIOR ART

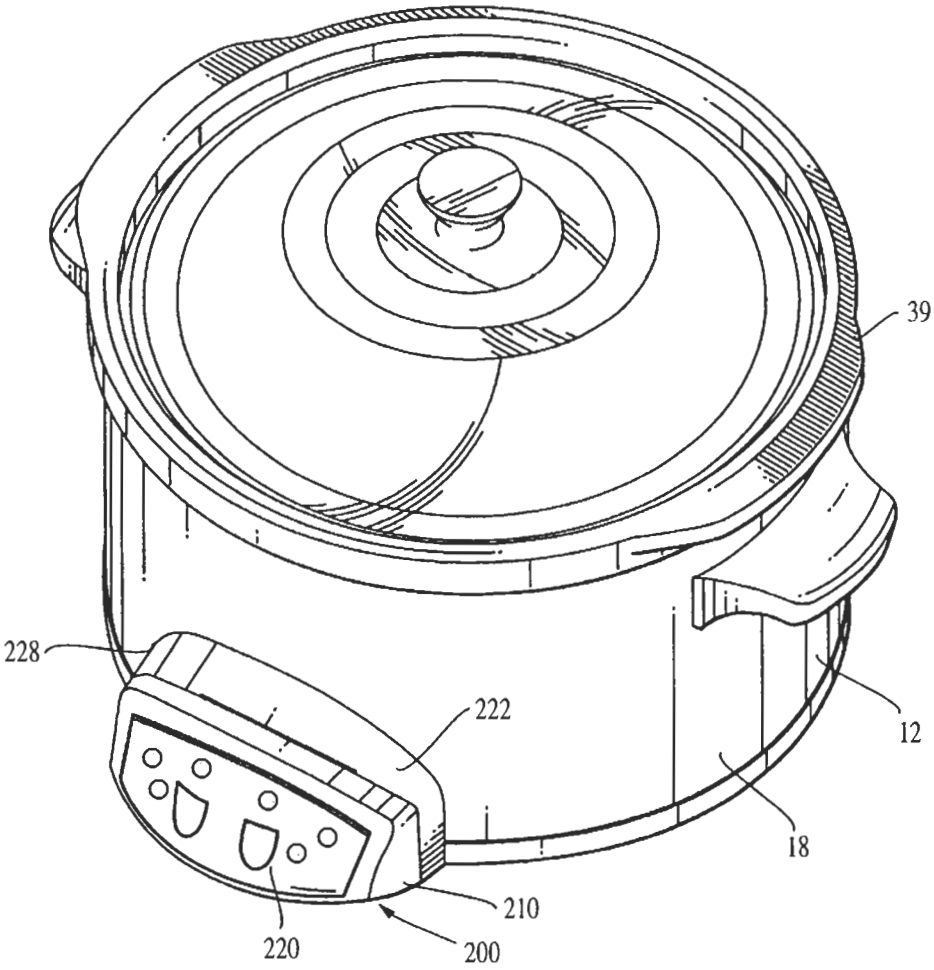


FIG. 4

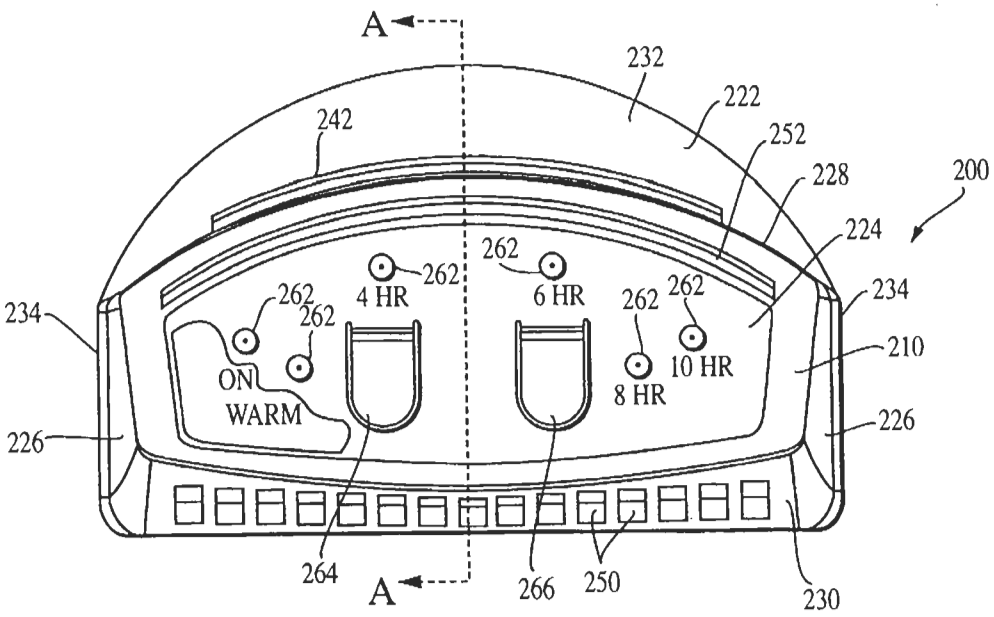

A
232
222
242
252
228
200
224
262
262
4 HR
262
6 HR
262
262
234
234
262
262
ON
WARM
10 HR
8 HR
210
226
226
264
A
266
250
230

FIG. 5

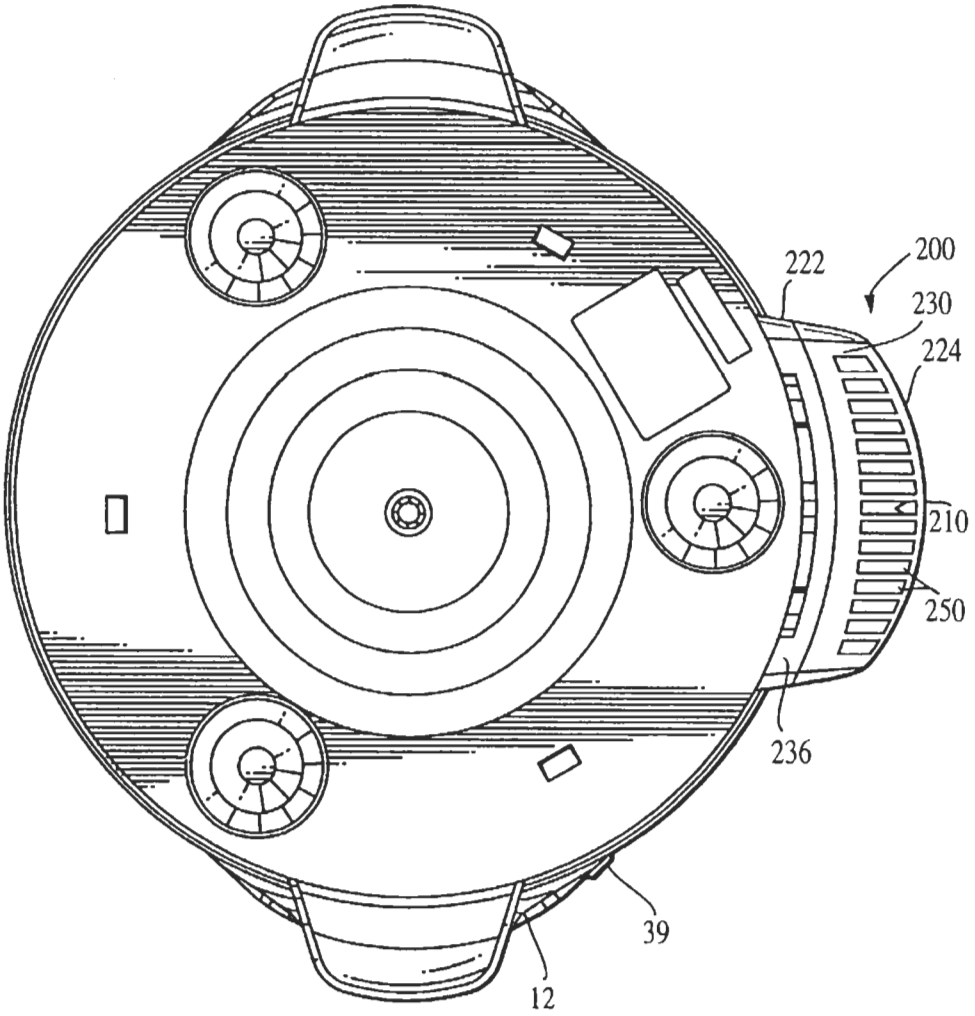


FIG. 6

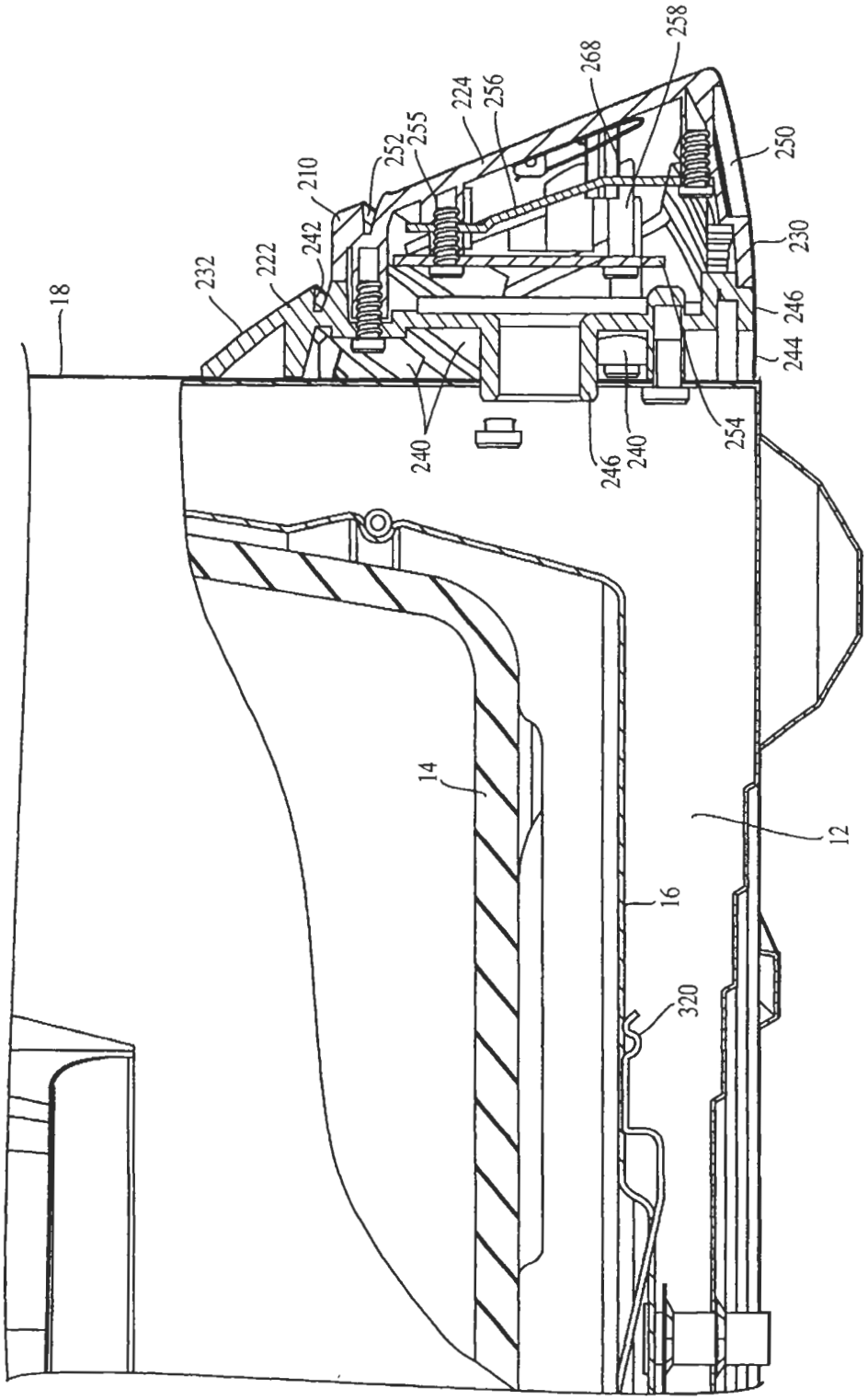

18
232
222
242
210
252
255
224
256
268
258
250
230
246
244
254
240
246
240
14
12
16
320

FIG. 7

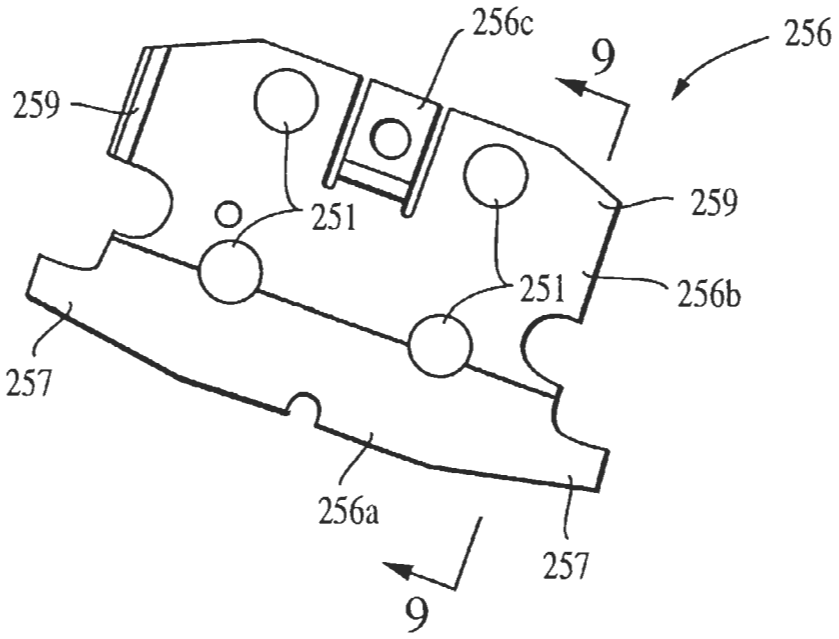


FIG. 8

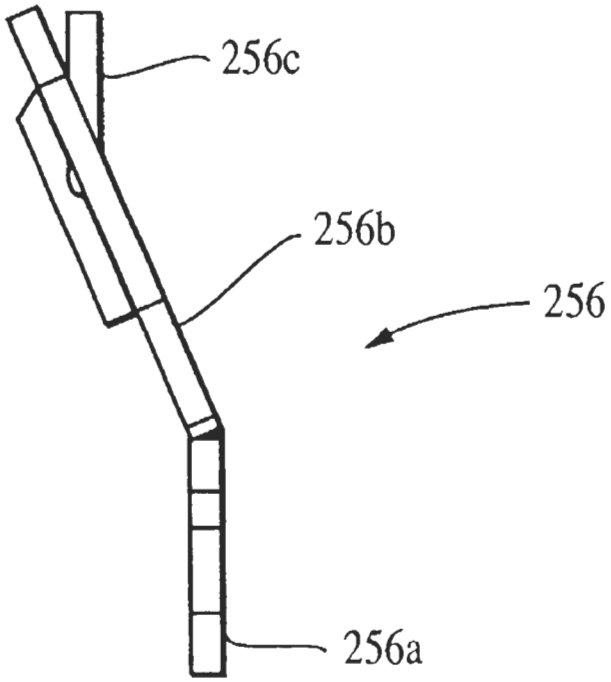


FIG. 9

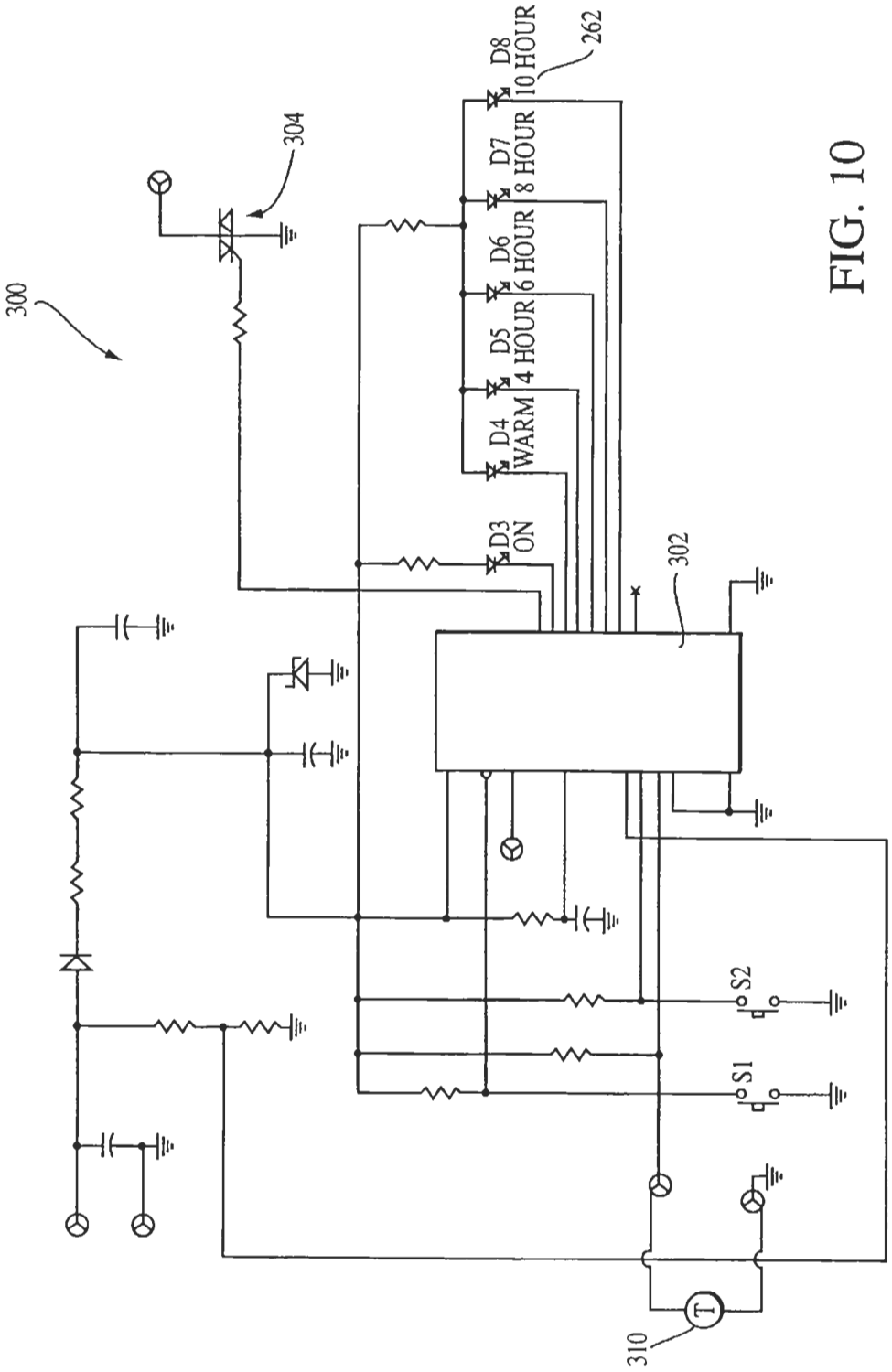

300
304
D8
10 HOUR
262
D7
8 HOUR
D6
6 HOUR
D5
4 HOUR
D4
WARM
D3
ON
302
S2
S1
310

FIG. 10

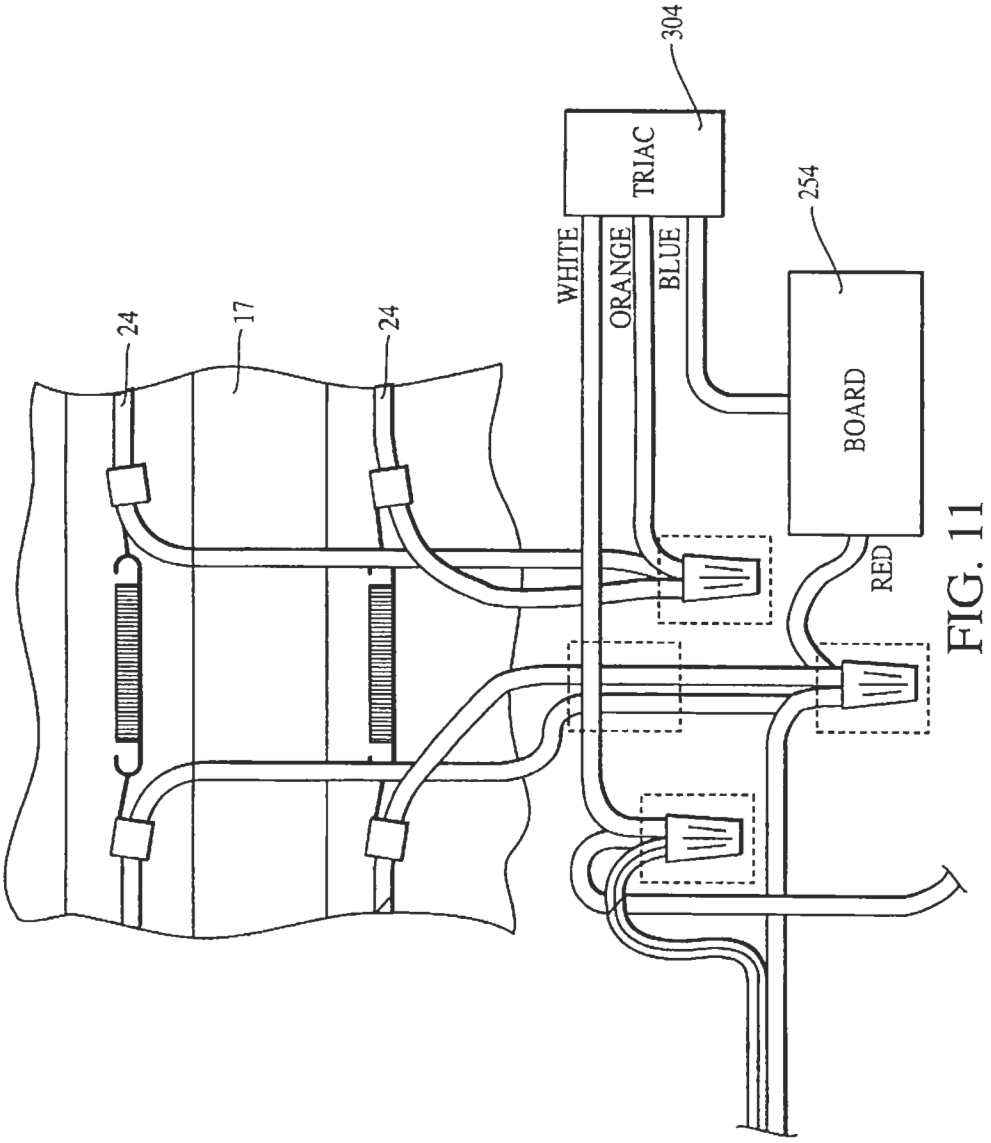


FIG. 11

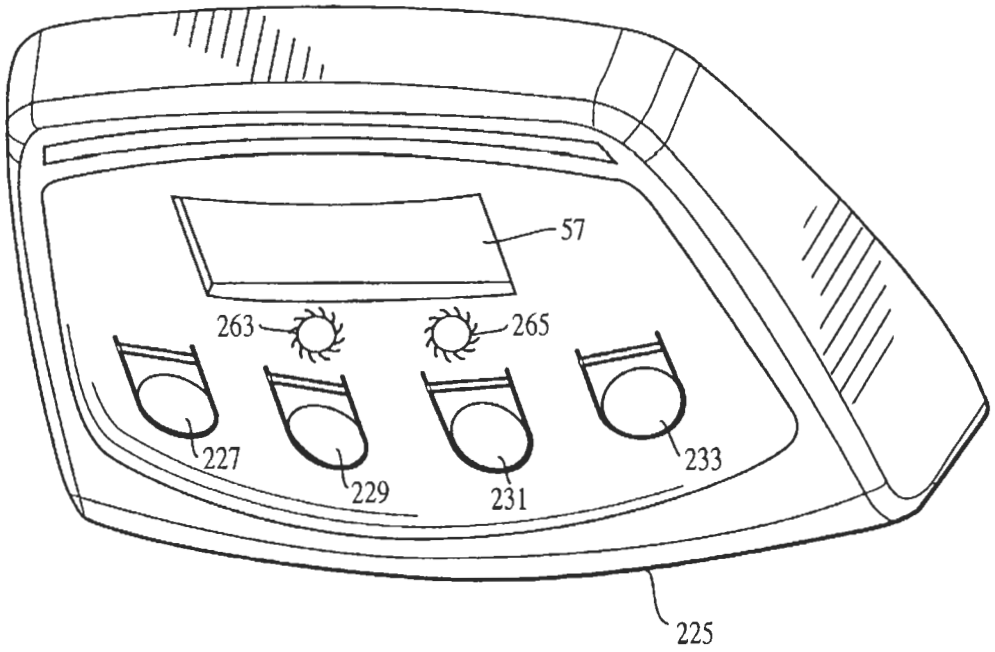


FIG. 12

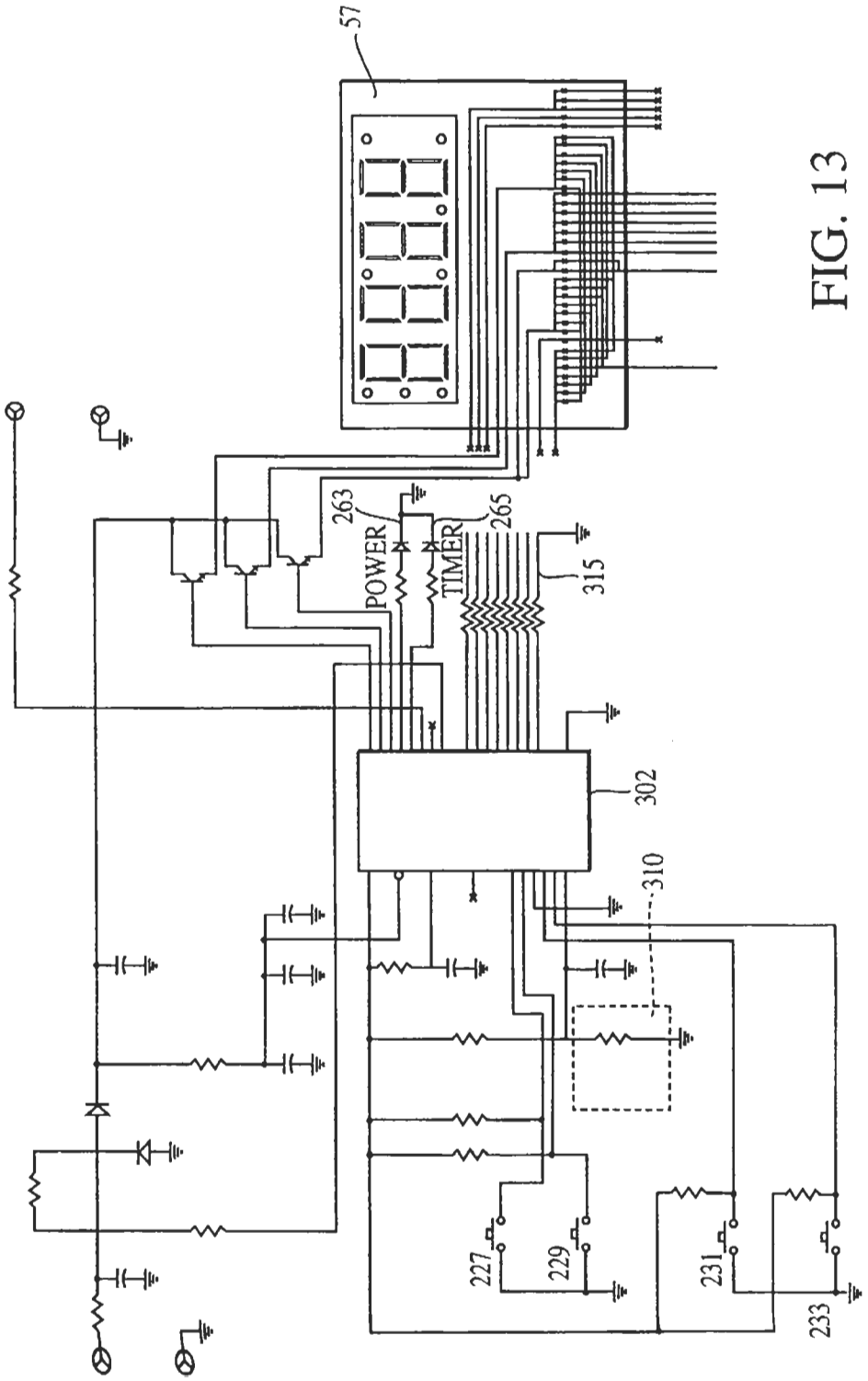


FIG. 13

PROGRAMMABLE SLOW-COOKER APPLIANCE

This application is a continuation of application Ser. No. 09/802,174, filed Mar. 8, 2001, (pending), which is hereby incorporated by reference herein.

This application claims priority to Provisional Application No. 60/189,443, filed Mar. 15, 2000, and to Provisional Application No. 60/196,273, filed Apr. 5, 2000.

This application also claims priority to U.S. patent application Ser. No. 09/802,174, filed Mar. 8, 2001, now U.S. Pat. No. 6,573,483 the entirety of which is incorporated herein.

BACKGROUND OF THE INVENTION

Time and convenience are in short supply for homemakers wishing to supply a home-cooked meal to family members. Some appliances, such as slow-cooker appliances, attempt to meet this need by providing all-day cooking while a homemaker is absent. Such appliances, however, tend to be of the type where only one temperature and all day cooking is possible, regardless of the food item, and thus potentially subjecting the food item to over- or under-cooking. Another option may be to use a cooking unit with, a controller, where a user may set a time or temperature desired. These units, however, tend to be quite a bit larger and more expensive than slow-cooker appliances. If these units are of more reasonable size, they also suffer because the controller inevitably must be placed near the heating element.

What is needed is a cooking appliance in which the user retains control over the time and temperature of cooking, but which is small enough to be convenient. What is needed is a slow-cooker unit in which the controller does not become overheated and damaged by the heating element.

SUMMARY OF THE INVENTION

One embodiment of invention is a programmable slow-cooker appliance, including a heating unit, which includes upstanding sidewalls and a bottom wall. The sidewalls and bottom encompass a heating area. The appliance includes a heating element mounted on the inner surface of the interior wall of the heating unit. In one embodiment, the cooking area may also encompass a cooking unit inside the heating unit, suitable for holding food to be cooked. The appliance includes a programmable controller mounted thereto via a controller housing, which acts to insulate the controller from the heat of the appliance, preferably via a unique system of ventilation. The housing utilizes ventilation holes on its bottom and top to encourage a chimney effect, in which air from the surroundings is drawn through the housing. This air cools the controller, and the air is then exits from ventilation holes near the top of the housing, convecting heat away from the controller.

Another aspect of the invention is a method of using the programmable controller to ensure that food is cooked according to the desires of a user. The user provides a food item and places the food item into the slow-cooker appliance, as described above. The user sets a cooking time and temperature for the programmable slow-cooker unit, using the controls to set both the time and the temperature. The cooking time according to one embodiment may not be set less than four hours, and the temperature may not be set for less than 150 degrees Fahrenheit (66 degrees Celsius). This prevents a user from accidentally setting the cooker to a "warm" temperature, in which food would only be warmed but not cooked thoroughly before consumption. In one embodiment, if the user sets no time or temperature, but merely turns the cooker on, the cooker defaults to a particular time and temperature, set by the user or the factory, such as a default setting of four hours and 175 degrees Fahrenheit or eight hours and 150 degrees Fahrenheit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an embodiment of a prior art slow-cooker appliance having an oval shape that may be utilized in the present invention;

FIG. **2** is a perspective view of a prior art embodiment of a cooking unit **14** which may be utilized with the appliance of FIG. **1**;

FIG. **3** is a perspective view of a prior art cooking unit **39** similar to that shown in FIG. **2**, but having a circular shape;

FIG. **4** is a perspective view of a slow cooker appliance incorporating the present invention;

FIG. **5** is a detailed plan view of a portion of the control **200** of the embodiment of FIG. **4**;

FIG. **6** is a bottom plan view of the embodiment of FIG. **4**;

FIG. **7** is a side cutaway view of the embodiment of FIG. **4**;

FIG. **8** is a plan view of a heat sink **256** as utilized in the embodiment of FIG. **4**;

FIG. **9** is a side view taken along a line **9**—**9** of FIG. **8**;

FIGS. **10** and **13** are schematic circuit diagrams showing the circuitry and components implemented in preferred embodiments;

FIG. **11** is a wiring diagram showing some of the electric componentry of the preferred embodiment; and

FIG. **12** is an embodiment of the front panel.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, one prior art embodiment of a food-heating slow-cooker appliance **10** is shown. The appliance **10** preferably comprises a heating, unit **12** and a cooking unit **14**. An exemplary slow cooker appliance **10** may be a Crock-Pot® Slow Cooker made by The Rival Division of The Holmes Group® of Milford, Mass. The heating unit **12** preferably has a bottom **16** and a continuous outer sidewall **18**. The bottom **16** and an interior sidewall **17** define a well-like heating chamber **20** having an oval cross-section, and the interior sidewall **17** defines an annular lip **22** at an upper edge of the outer sidewall **18** and the interior sidewall **17**. The heating chamber **20** has a heating element **24** disposed therein and mounted to the heating unit **12**, either under the bottom **16** or additionally between the outer sidewall **18** and the interior sidewall **17**. A control switch **26** is conventionally used to provide electricity to the heating element **24**. The heating element **24** functions to heat the cooking unit **14** via the heating chamber **20**.

As shown in FIG. **2**, the cooking unit **14** has a bottom **28** with preferably a continuous sidewall **30** upstanding therefrom. The continuous sidewall **30** preferably has an annular lip **38** projecting in flange-like fashion from the upper end thereof and a substantially oval cross-section. The cooking unit **14** is adapted to be at least partially received within the heating unit **12** with the annular lip **38** of the cooking unit **14** preferably engaging the annular lip **22** of the heating unit **12**, supporting the cooking unit **14** within the heating unit **12**. Preferably, the annular lip **38** further defines a pair of handle portions **38**(*a*) and **38**(*b*) to facilitate lifting the cooking unit **14**. The cooking unit **14**is preferably made of ceramic with a coating of conventional glazing compound.

The thermal and heat retaining properties of the ceramic cooking unit **14** allow it to conduct heat from the heating chamber **20** through the sidewall **30**. This provides even heating throughout the unit **14**.

As shown in FIG. **3**, an alternative embodiment of the appliance **10** includes a cooking unit **39** having a sidewall **40** and a substantially circular cross-section. This embodiment is preferably adapted to fit within a heating unit having a complementary circular heating chamber. This cooking unit **39** is used in an embodiment of the present invention shown in FIG. **4**.

In use, the heating unit **12** is provided with a first cooking unit **39**. The heating element **24** (not shown) may be powered on and off as necessary to supply heat at a maintained temperature to the cooking unit **39** and the heating chamber via a programmable control **200**. The control **200** preferably includes a circuit board housing **210**, a control panel **220**, and an insulation shield **222** assembled together for attachment to the outer sidewall **18** of the heating unit **12**. The interior of the housing **210** contains a printed circuit board **254** (shown in FIG. **7**) containing electronic components of the control.

As shown in FIGS. **5** and **6**, the housing **210** preferably includes a control panel user interface **224** located on an inclined front surface of the housing **210**. Preferably, the housing **210** and insulation shield **222** are made from a thermoplastic material such as polypropylene. A pair of side walls **226**, a top wall **228**, and bottom wall **230** are preferably located adjacent the control panel **224** and support the control panel **224** in an inclined position away from the front of the cooking appliance **10**. This gives the user access to the control panel **224**, and also locates the controls and componentry within the housing **210** away from a significant amount of the heat generated by the appliance **10**. The printed circuit board **254** may be mounted via threaded screws **255** to rearwardly projecting screw receiving portions **258** on the rear side of the housing **210**.

The control panel **224** includes a plurality of indicator lights, such as LEDs **262**, spaced on the front panel **224**. As is well-known in the art, a variety of other indicator devices may be provided, including digital readouts, audible alarms, liquid crystal displays, incandescent lamps or fluorescent readouts. Preferably, the control panel **224** also includes a plurality of cantilevered portions **264** and **266** as shown in FIG. **5**. The cantilevered portions **264**, **266** preferably include rearwardly projecting fingers **268** (shown in FIG. **7**) which translate the depression of the portions **264**, **266** toward the rear portion of the housing **210**. The fingers **268** are preferably used to depress pushbutton switch portions located on the circuit board **254**. A water-impermeable label membrane may be applied over the front of the control panel **224** to label the indicators **262** and cantilevered portions **264** and **266** for the user. The membrane may also protect the front control panel **224** from damage from spilled foods or liquids and facilitate cleaning.

To further protect the electronic componentry within the housing **210** from the heat generated by the appliance **10**, the annular shield member **222** is preferably sized for interposition between the heating unit **12** and the housing **210**. In particular, as shown in FIGS. **5** and **6**, the shield **222** includes a top wall **232**, a pair of side walls **234**, and a bottom wall **236**. The shield **222** acts as a ventilated spacer to hold the electronic components and the housing **210** at a distance away from sidewall of the cooking unit **12**.

In order to dissipate heat that may otherwise be retained between the cooking unit **12** and the rear of the housing **210**, an air circulation space is provided within the shield. In particular, as shown in the side cutaway view of FIG. **7**, the air space **240** behind the shield **222** may vent warmer air out through an upper elongated slot **242** defined within the top wall **232** of the shield **222**. Likewise, an elongated slot **244** is defined into the air space **240** in the bottom wall **236** of the shield **222**. Heated air may thus escape through the top elongated slot **242** and cooler air may enter the air space **240** through the bottom elongated slot **244**. As shown in FIG. **7**, the shield **222** also preferably defines a rearwardly projecting cylindrical flange **246** that extends into the outer wall **18** to allow passage of control and power wiring between the interior of the heating unit **12** and the interior of the housing **210**.

In a similar fashion, air circulation is promoted through the housing **210** through a set of openings, preferably defined between the upper portion and, the bottom of the housing **210**. In particular, a plurality of openings **250** are defined within the bottom wall **230** of the housing **210**. An elongated upper slot **252** is provided on the front face **224** of the housing **210**. This allows air to freely circulate behind the control panel **224** and assist in the dissipation of heat from the circuit board **254** and its electronic componentry within the housing **210**. Preferably, a heat sink **256** is provided as shown in FIG. **7** and positioned between the circuit board **254** and the front panel **224** inside the housing **210**. The sink **256** preferably includes a plurality of openings defined therein to allow air to circulate between the openings **250** and **252** and through and around the heat sink **256** to dissipate additional heat therefrom. Also shown is the relative position of cooking unit **14**.

FIGS. **8** and **9** show a detailed view of the heat sink **256**. Preferably, the heat sink is machined from 0.063 inch thick 3003-0 anodized aluminum. The heat sink **256** is preferably bent at a 160 degree angle between a bottom flange portion **256***a* and an upper portion **256***b*. A centrally located retaining tab portion **256***c* is bent parallel with the lower portion **256***a*, and the portions **256***a* and **256***c* are used for attachment of the heat sink **256** to the rear side of the housing **210** interior via the rearwardly projecting screw receiving portions **258**. To maximize the dissipation of heat, a plurality of winged sections **257** and **259** are provided on the heat sink **256** and extend outwardly from a center portion **256***a* of the heat sink **256**. A plurality of openings are defined through the heat sink **256** to allow the fingers **258** of the control panel cantilevered portions **264**, **266** to project through the heat sink and contact the circuit board **254** at the rear of the housing **210**. The openings **251** also facilitate cooling air flow through and past the heat sink **256** to further dissipate heat therefrom.

The circuit board **254** mounts circuitry and logic allowing the user of the appliance **10** to electronically control and program cooking cycles and temperature. A schematic diagram of the electronic circuitry and components is shown in FIG. **10**. The diagram shows a preferred exemplary circuit incorporating preferred components as utilized in the preferred embodiment of the present invention. One skilled in the art will recognize that the componentry illustrated herein is exemplary only and that many other components may be substituted to achieve the functions described herein. FIG. **10** includes labels for each of the components of the circuit, and only major components will be described herein.

First, as shown in the diagram, the preferred circuit **300** is preferably built around an EPROM/ROM-based CMOS microprocessor controller **302**, such as the PIC16CR54C RISC CPU manufactured by Microchip Technology, Inc. The chip output preferably includes circuited drivers for **6**

LED indicators **262** (labeled D3–D8) as shown. These LED indicators may be assigned labels as follows:

LED	Indicates
D3	On
D4	WARM
D5	4 HOUR
D6	6 HOUR
D7	8 HOUR
D8	10 HOUR

Two momentary pushbutton contact switches S1 and S2 are used to trigger the "Off" and "Cook" features, respectively, as will be described in the cooking procedure below. Of course, other indicators and switches may be substituted. Note that while examples are given, the circuitry may be implemented in numerous ways, as is well-known in the art, to accomplish the varying programming modes described below.

The temperature of the cooking appliance is measured using a thermistor **310**, which is connected externally of the circuit board to the underside of the bottom of the heating chamber. A retention clip **320**, shown in FIG. **7**, is utilized to hold the thermistor in thermal contact with the bottom **16**. In a preferred embodiment, the appliance uses a model USX1732 thermistor manufactured by U.S. Sensor, Inc.

Triac **304**, which is preferably a logic Triac Model L4008L6-ND manufactured by Digi-Key, Inc., is utilized to switch the power supplied to the heating elements of the appliance. Preferably, the Triac is of an isolated tab type and includes a heat sink tab that is fastenable to the heat sink **256** shown in FIGS. **8** and **9**. Preferably, the Triac is mounted separately to one of the mounting holes on the center portion **256***a* of the heat sink **256** so that the tab is in thermal contact with the heat sink **256** to dissipate heat generated from its current controlling function. Most of the other components of the circuit **300** are mounted on a conventional printed circuit board **254**.

FIG. **11** shows the wiring of the external Triac **304** in relation to the circuit board **254** and heating elements **24**. As shown in the Figure, the heating elements **24** are in thermal contact with and wrapping around the interior sidewall **17** of the heating unit.

The operation of the appliance **10** is as follows. The programmable circuitry **300** allows the user to set both the temperature and desired time for cooking. The functions of the switches Si and S2, which are activatable via the cantilevered portions **264** and **266** of the control panel **224**, are as follows:

S1. OFF pushbutton—turns the appliance **10** off.

S2. COOK pushbutton—subsequent pushes of the button cycle through 4 hour, 6 hour, 8 hour and 10 hour cook times.

When the unit is plugged in, the power "on" indicator flashes. The user then pushes the COOK button (switch S2) to set the temperature and cooking time. As the user pushes the COOK switch S2, the LED's D5–D8 illuminate to indicate the corresponding time setting as follows.

LEDs

D3. POWER—on when appliance **10** is in cook or warm modes.

D5. 4 HOUR—on when appliance is in 4-hour cook mode

D6. 6 HOUR—on when appliance is in 6-hour cook mode

D7. 8 HOUR—on when appliance is in 8-hour cook mode

D8. 10 HOUR—on when appliance is in 10-hour cook mode

D4. WARM—on when appliance is in half-power mode

Thus, subsequent pushes of the COOK switch S2 activate different cooking modes, as shown by the 6 HOUR, 8 HOUR and 10 HOUR LEDs **262** on the control panel **224**. If the COOK switch S2 is pressed in the 10 HOUR mode, the control **200** recycles to the 4 HOUR cooking mode, and its indicator.

In general, full power will be applied to the heating element **24** until the time corresponding to the illuminated LED elapses, after which the power to the heating element **24** is reduced by half, the WARM indicator illuminates and all cook time indicators extinguish. The choices of operation are: 4 or 6 hours on a HI temperature, and 8 to 10 hours on a lower temperature setting. Once the user selects the desired setting, the appliance **10** starts the cooking operation. Once the time setting has expired, the appliance **10** automatically reduces power to the heating element **24** to put the unit in a WARM setting. The unit will stay in the WARM setting until the user pushes the OFF button or unplugs the unit. Of course, other programming schemes are possible.

Preferably, the user cannot set the unit initially in the WARM setting. The system will only go to WARM after one of the time functions has expired. This avoids possible food safety problems that may be associated with cooking food only on the WARM setting. Pressing the OFF switch Si any time the unit is on preferably removes power from the heating element **24** and extinguishes all indicator LEDs **262**.

In another embodiment, the slow-cooker appliance utilizes four push-button switches, rather than two, to set times and temperatures for cooking. An exemplary control panel is depicted in FIG. **12**, with control circuitry in FIG. **13**. Four momentary pushbutton contact switches **227, 229, 231, 233** are used to trigger various power and setting functions as will be described in the cooking procedure below. Of course, other numbers or types of indicators and switches may be substituted as well. FIG. **13** shows circuitry applicable to such an embodiment, incorporating controller **302**, external temperature element **310**, digital readout **57**, and Power LED **263** and Timer LED **265**. The Power LED indicates power is present at the microprocessor controller and the Timer LED indicates that the Timer function is on and working.

The operation of the appliance is as follows. The programmable circuitry allows the user to set both the temperature and the desired cooking time. The functions of the switches **227, 229, 231, 233** on an alternative embodiment of a control panel user interface **225**, are as follows:

227. ON/OFF power pushbutton—turns the appliance on and off.

229. TIMER pushbutton—activates stepped timer.

231. UP pushbutton—increases displayed numerical value.

233. DOWN pushbutton—decreases displayed numerical value.

When the unit is plugged in, the unit defaults to 150-degrees F. as shown on the digital display **57**. The user may adjust the desired cooking temperature in 25-degree increments using the UP **231** button or the DOWN button **233**, with 150 degrees Fahrenheit as a minimum temperature. Once the user has selected the specific temperature, the appliance will start the cooking process.

The user may also select the TIMER mode by pressing the TIMER button **229**. In TIMER mode, the controller defaults to 4 hours. The user can use the UP or DOWN controls to

increase or decrease the time in 15-minute increments. Once the time is set, the controller **302** will count down the time remaining for cooking in 1 minute increments until the unit "times out". At that time, the power is shut off from the heating element.

In all modes, the temperature is read periodically by the thermistor or other temperature element and relayed to the controller. The reading is checked at 4-second intervals. If the temperature is above or equal to the set point, power is removed. If it is below the set point, power is applied to the heating element **32**. Of course, the circuitry can be modified as desired to achieve various program methods and modes.

Another embodiment of the slow cooker appliance adds a piezobuzzer to the circuitry. A piezobuzzer is simply an electrically-activated buzzer that can be programmed to emit a sound at desired moments. In one embodiment, a piezobuzzer may be installed as an output **315**, controlled by the microprocessor controller **302**, as shown in FIG. **13**, and programmed to emit a sound when desired. In one embodiment, the buzzer may beep to provide feedback to a user when a pushbutton is pushed. The slow cooker may also be programmed to emit a sound to indicate the end of the cooking time. The buzzer may also be used to emit sounds at other desired times.

It is intended that the foregoing description illustrates rather than limits this invention, and that it is the following claims, including all equivalents, which define this invention. Of course, it should be understood that a wide range of changes and modifications may be made to the embodiments described above. Accordingly, it is the intention of the applicants to protect all variations and modifications within the valid scope of the present invention. It is intended that the invention be defined by the following claims, including all equivalents.

What is claimed is:

1. A programmable slow-cooker appliance comprising:

a heating unit including a bottom and a continuous sidewall extending from said bottom, said bottom and said continuous sidewall including an outer sidewall and an interior sidewall and defining a well-like heating chamber;

a heating element mounted to said heating unit and disposed between said outer sidewall and said interior sidewall;

a cooking unit at least partially received within said well-like chamber;

a non-conductive housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit, said housing having a bottom wall;

a lower vent in said bottom wall of said housing for admitting relatively cool air to said housing;

an upper vent in said housing for allowing the escape of relatively warm air from said housing;

a programmable circuit positioned within said housing such that heat is convected away therefrom as air passes through said housing and said vents and electrically connected to said heating element to electronically control and program cooking cycles and temperature; and

a control panel on said housing, said control panel being electronically connected to said programmable circuit.

2. A programmable slow-cooker appliance as described in claim **1** wherein said housing is comprised of a shield and a housing portion, said shield being interposed between and adjoining said outer sidewall of said heating unit and said housing portion, said control panel being incorporated on said housing portion.

3. A programmable slow-cooker appliance as described in claim **2** including a circuit board including said circuit mounted to and positioned within said housing, and a Triac electrically connected between said circuit board and said heating element.

4. A programmable slow-cooker appliance as described in claim **3** further including a heat sink position within said housing between said circuit and said control panel.

5. A programmable slow-cooker appliance as described in claim **4** wherein said Triac includes a heat sink tab in thermal contact with said heat sink.

6. A programmable slow-cooker appliance as described in claim **1** wherein said control panel includes a user interface located on an inclined front surface of said housing spaced away from said outer sidewall of said heating unit.

7. A programmable slow-cooker appliance as described in claim **6** wherein said lower and upper vents are positioned to allow air to circulate behind said control panel and assist in the dissipation of heat from said programmable circuit.

8. A programmable slow-cooker appliance as described in claim **6** wherein said housing is comprised of a shield and a housing portion, said shield being interposed between and adjoining said outer sidewall of heating unit and said housing portion, said control panel being incorporated on said housing portion.

9. A programmable slow-cooker appliance as described in claim **8** wherein said upper and lower vents are in said housing portion.

10. A programmable slow cooker appliance as described in claim **9** wherein said housing is comprised of a thermoplastic material.

11. A programmable slow-cooker appliance as described in claim **1** wherein said cooking unit is made from a ceramic material and is removably positioned in said well-like chamber.

12. A programmable slow-cooker appliance comprising:

a heating unit including a bottom and a continuous sidewall extending from said bottom, said bottom and said continuous sidewall defining a well-like chamber;

a heating element mounted to said heating unit for providing heat to said well-like chamber;

a ceramic cooking unit removably positioned in said well-like chamber;

a non-conductive housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit;

a programmable circuit positioned within said housing and electrically connected to said heating element to electronically control and program cooking cycles and temperature;

means including vents in said housing for cooling said programmable circuit by convecting heat away therefrom; and

a control panel mounted to said housing and electrically connected to said programmable circuit.

13. A programmable slow-cooker appliance as described in claim **12** wherein said programmable circuit includes a microprocessor controller.

14. A programmable slow-cooker appliance as described in claim **13** wherein said housing is comprised of a shield and a housing portion, said shield being interposed between and adjoining said sidewall of said heating unit and said housing portion, said control panel being incorporated on said housing portion.

15. A programmable slow-cooker appliance as described in claim **12** including means for automatically switching said heating element from a cook mode to a warm mode.

16. A programmable slow-cooker appliance as described in claim 15 including a Triac electrically connected between said programmable circuit and said heating element.

17. A programmable slow-cooker appliance as described in claim 16 including a heat sink positioned within said housing, said Triac including a heat sink tab in thermal contact with said heat sink.

18. A programmable slow-cooker appliance as described in claim 12 wherein said means for cooking includes a lower vent in said housing for admitting relatively cool air to said housing and an upper vent in said housing for allowing the escape of relatively warm air from said housing.

19. A programmable slow-cooker appliance as described in claim 12 wherein said programmable circuit is configured to switch said heating element from a cooking mode to a warming mode at the expiration of a set cooking time.

20. A programmable slow-cooker appliance comprising:

a heating unit including a bottom and a continuous sidewall extending from said bottom, said bottom and said continuous sidewall defining a well-like chamber, said continuous sidewall including an outer sidewall and an interior sidewall;

a heating element mounted to said heating unit and disposed between said outer sidewall and said interior sidewall;

a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit;

a programmable circuit positioned within said housing and configured to automatically switch said heating element from a cook mode to a lower temperature warm mode at the end of a set cooking time;

a control panel mounted to said housing and including a user interface connected to said programmable circuit for selecting a cooking temperature and cooking time; and

a cooking unit removably positioned in said well-like chamber.

21. A programmable slow-cooker appliance as described in claim 20 wherein said housing includes a plurality of vent openings, a thermoplastic shield and a housing portion, said shield being disposed between and adjoining said outer sidewall of said heating unit and said housing portion, said housing portion including a control panel.

22. A programmable slow-cooker appliance as described in claim 21 including a heat sink positioned within said housing.

23. A programmable slow-cooker appliance as described in claim 22 including a Triac positioned within said housing and electrically connected between said programmable circuit and said heating element, said Triac being in thermal contact with said heat sink.

24. A programmable slow-cooker appliance as described in claim 20 wherein said housing is comprised of a thermoplastic material and said cooking unit is comprised of a ceramic material, said cooking unit being removably positioned in said well-like chamber.

25. A programmable slow-cooker appliance as described in claim 21 wherein said housing is comprised of a thermoplastic material and said cooking unit is comprised of a ceramic material.

26. A programmable slow-cooker appliance as described in claim 20 wherein said programmable circuit is configured such that a user cannot initially set a lower temperature warm mode.

27. A programmable slow-cooker appliance as described in claim 20 including a switch operatively associated with said control panel, said programmable circuit being configured such that subsequent pushes of said switch activates different cook modes.

28. A programmable slow-cooker as described in claim 27 wherein said housing is vented.

29. A programmable slow-cooker appliance as described in claim 20 wherein said housing includes a thermoplastic portion adjoining and extending into said continuous sidewall of said heating unit.

30. A programmable slow-cooker appliance as described in claim 20 wherein said circuit is configured to default to cause operation of said appliance at a cooking temperature when plugged into a power source.

31. A slow-cooker appliance comprising:

a heating unit including a bottom and a sidewall defining a well-like heating chamber and a heating element for providing heat to said heating chamber;

a ceramic cooking unit including a bottom, a continuous sidewall upstanding from said bottom, and a lip extending outwardly from said sidewall, said cooking unit being dimensioned to be at least partially received within said well-like heating chamber and supported by engagement of said lip with said heating unit;

a housing assembly mounted to and projecting outwardly from said sidewall of said heating unit, said housing assembly including a thermoplastic portion adjoining said outer sidewall, an inclined front surface including a control panel having a user interface, and a vent opening; and

a programmable circuit positioned within said housing assembly, said user interface being connected to said programmable circuit for selecting cooking temperature and cooking time, said programmable circuit being configured to automatically switch said heating element from a cook mode to a lower temperature warm mode at the end of a set cooking time.

32. A slow-cooker appliance as described in claim 31 wherein said thermoplastic portion of said housing assembly extends into said sidewall of said heating unit.

33. A slow-cooker appliance as described in claim 31 wherein said housing assembly includes a bottom wall including a plurality of vent openings.

34. A slow-cooker appliance as described in claim 33 wherein said housing assembly includes a plurality of upper vent openings such that heat is convected away from said programmable circuit as air flows into said housing assembly through said vent openings in said bottom wall, through said housing assembly, and out of said housing assembly through said upper vent openings.

35. A slow-cooker appliance as described in claim 31 including a switch operatively associated with said control panel, said programmable circuit being configured such that subsequent pushes of said switch activates different cook modes.

36. A slow-cooker appliance as described in claim 31 wherein said circuit is configured to default to cause operation of said appliance at a cooking temperature when plugged into a power source.

37. A programmable slow-cooker appliance comprising:

a heating unit including a bottom and a continuous sidewall defining a well-like heating chamber and a heating element positioned for providing heat to said well-like heating chamber;

a cooking unit including a lip and adapted to fit at least partially within said heating unit such that said lip engages a top portion of said heating unit;

a housing assembly mounted to and projecting from said sidewall of said heating unit, said housing assembly including a thermoplastic portion adjoining said sidewall of said heating unit, a bottom wall adjoining said sidewall, and an inclined front surface including a control panel user interface spaced from said sidewall; and

a circuit including a programmable controller positioned within said housing assembly and operatively associated with said user interface, said circuit being configured to allow a user to set both cooking temperature and cooking time and to cause said heating element to operate in a warm mode at the expiration of a set cooking time, said control panel being electronically connected to said circuit.

38. A programmable slow-cooker appliance as described in claim **37** wherein said circuit is incorporated on a printed circuit board and a heat sink is positioned in said housing assembly between said printed circuit board and said control panel user interface.

39. A programmable slow-cooker appliance as described in claim **37** wherein said bottom wall of said housing assembly is vented.

40. A programmable slow-cooker appliance as described in claim **37** wherein said housing assembly includes an upper vent opening positioned such that, when operated, relatively cool air enters said housing assembly through said vented bottom wall, passes over said circuit, and relatively warm air exits said housing assembly through said upper vent opening.

41. A programmable slow-cooker appliance as described in claim **37** wherein said circuit is configured to default to cause operation of said appliance at a cooking temperature when plugged into a power source.

42. A programmable slow-cooker appliance as described in claim **41** including a switch operatively associated with said control panel such that subsequent pushes of said switch activates different cooking times and temperatures.

* * * * *

EXHIBIT C

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

THE HOLMES GROUP, INC.,	:	
	:	
Plaintiff,	:	Civil Action No. 05-CV-11367 WGY
v.	:	(Alexander, M.J.)
	:	
WEST BEND HOUSEWARES, LLC and FOCUS PRODUCTS GROUP, L.L.C.,	:	
	:	
Defendants.	:	

HOLMES' SUPPLEMENTAL RESPONSE TO WEST BEND'S INTERROGATORY NO. 1 IN VIEW OF CLAIM CONSTRUCTION BY THE COURT

Plaintiff, The Holmes Group, Inc. (hereinafter "Holmes") submits the following Supplemental Response to Defendants, West Bend Housewares, LLC and Focus Products Group, L.L.C. (hereinafter collectively "West Bend") Interrogatory No. 1 in view of the claim construction issued by the Court at a *Markman* Hearing conducted on September 27, 2006.

The Supplemental Response is subject to the following general objections.

GENERAL OBJECTIONS

Each of Holmes' responses are subject to the following objections and conditions as if such objections and conditions were fully set forth in said response. The responses do not repeat each such objection or condition.

1. Holmes objects to the Interrogatories to the extent they request information not relevant to the subject matter of the pending action.

2. Holmes objects to the Interrogatories to the extent they are unreasonably cumulative or duplicative, or seek information obtainable from some other source that is more convenient, less burdensome or less expensive.

3. Holmes objects to the Interrogatories to the extent they request information that is protected from disclosure by the attorney-client privilege, the attorney work product doctrine, the protection afforded to materials prepared in anticipation of litigation or any other applicable privilege or immunity. Nothing contained in these objections and responses is intended to be, or in any way constitutes, a waiver of any applicable privilege, immunity or doctrine. Any document or thing withheld on the grounds of an applicable privilege or immunity will be identified on a separate privilege log. Holmes objects to identifying documents generated since the inception of this lawsuit by or at the direction of trial counsel, as such identification is likely to reveal work-product and/or attorney-client privileged information.

4. Holmes objects to the disclosure of confidential information and the production of documents containing confidential information until the Court enters an appropriate Protective Order.

5. Holmes objects to the Interrogatories to the extent they impose obligations on Holmes that go beyond the requirements set forth in the Federal Rules of Civil Procedure and Local Rules for the District of Massachusetts.

6. Holmes objects to West Bend's definitions and instructions to the extent they impose obligations on Holmes that go beyond the requirements set forth in the Federal Rules of Civil Procedure and Local Rules for the District of Massachusetts.

7. As discovery in this case is ongoing, Holmes reserves the right to supplement its objections and responses to West Bend's requests.

SPECIFIC OBJECTIONS AND RESPONSES

Subject to the foregoing General Objections, Holmes responds as follows:

Interrogatory No. 1

Identify each claim of the Holmes patents-in-suit that you contend is infringed by West Bend Housewares or Focus and state in detail your infringement contentions and claim construction by completing a claim chart comparing each West Bend Housewares cooker you contend infringes any of the Holmes patents-in-suit with each asserted claim of each Holmes patent-in-suit, on a limitation-by-limitation basis, describing the complete factual and legal bases for any contention by Holmes that any claim limitation is present in the West Bend Housewares cooker(s) you accuse of infringement, including whether each element is present literally or present under the doctrine of equivalents, whether the alleged infringement is direct or indirect, and identifying the documents and things that you contend supports your contentions and claim construction, and each person having knowledge of any factual bases for the response.

Supplemental Response to Interrogatory No. 1

Holmes objects to this interrogatory to the extent that it seeks information protected by the attorney/client privilege and/or work product immunity. Subject to and without waiver this objection and the General Objections, Holmes responds as set forth in Exhibit A attached hereto. Holmes further responds that the documents and things supporting the infringement contention are the file histories of the Holmes patents-in-suit, the West Bend accused products and the West Bend Instruction Manual for the accused products. The persons having knowledge regarding the infringement contentions are counsel of record for Holmes, Charles R. Hoffmann and Glenn T. Henneberger.

VERIFICATION OF ANSWERS

I, Timothy Gallogly, Esq., an authorized agent of Sunbeam Products, Inc., d/b/a Jarden Consumer Solutions f/k/a The Holmes Group ("Holmes") declare that I have read the foregoing answers on behalf of Holmes, that I have read the foregoing answers and subscribe to the same on behalf of Holmes, that said answers were prepared with assistance and advice of counsel and other representatives of Holmes, that said answers, subject to inadvertent or undiscovered errors, are based on, and therefore, limited by the records and information still in existence, presently recollected and thus far discovered in the course of preparation of these answers; that consequently, Holmes reserves the right to make changes in the answers if it appears at any time that omissions or errors have been made therein or that more accurate information is available; and that subject to the limitations set forth herein, that said answers are true to the best of my knowledge, information and belief.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on October 6, 2006.

SUNBEAM PRODUCTS, INC.,
d/b/a JARDEN CONSUMER SOLUTIONS
f/k/a THE HOLMES GROUP

By: _____
Name: Timothy Gallogly, Esq.
Title: Vice-President and
Associate General Counsel

The undersigned subscribes to the foregoing objections.

Respectfully submitted,

SUNBEAM PRODUCTS, INC.,
d/b/a JARDEN CONSUMER SOLUTIONS
f/k/a THE HOLMES GROUP
By its Attorneys,

Dated: October 6, 2006

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CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing HOLMES' SUPPLEMENTAL RESPONSE TO WEST BEND'S INTERROGATORY NO. 1 IN VIEW OF CLAIM CONSTRUCTION BY THE COURT has been served via e-mail, this 6th day of October, 2006 upon the following:

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Glenn T. Henneberger

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

THE HOLMES GROUP, INC.,	:	
	:	
Plaintiff,	:	Civil Action No. 05-CV-11367 WGY
v.	:	(Alexander, M.J.)
	:	
WEST BEND HOUSEWARES, LLC and FOCUS PRODUCTS GROUP, L.L.C.,	:	
	:	
Defendants.	:	

EXHIBIT A TO HOLMES' SUPPLEMENTAL RESPONSE TO WEST BEND'S INTERROGATORY NO. 1 IN VIEW OF CLAIM CONSTRUCTION BY THE COURT

U.S. PATENT NO. 6,573,483 B1

Claim 13	West Bend Programmable Slow-Cooker	Literal/DOE
13. A method of using a programmable slow-cooker appliance, the method comprising:		
providing a food item;	Operating the West Bend's programmable slow-cooker includes the step of providing a food item.	literal
placing the food item into a cooking unit of the slow-cooker appliance;	Operating the West Bend's programmable slow-cooker includes the step of placing the food item into the cooking unit. (See Instruction Manual, p. 4.)[1]	literal
selecting a cooking temperature and time using a programmable controller mounted to a housing fixedly mounted to a heating unit; and	West Bend's programmable slow-cooker allows the user to select a cooking temperature and time using a programmable controller mounted to a housing, the housing being fixedly mounted to a heating unit. (See Instruction Manual, p. 4, program cooking, steps 1 and 2.)	literal and/or DOE
changing the heating unit temperature automatically to a lower temperature after the selected time.	The West Bend's programmable slow-cooker performs the step of automatically changing the heating unit temperature to a lower temperature after the expiration of the selected time. (See Instruction Manual, p. 4, program cooking, step 3.)	literal

[1] West Bend's Instruction Manual was attached as Exhibit C to Holmes' Complaint.

Claim 14	West Bend Programmable Slow-Cooker	Literal/DOE
14. The method of claim 13, further comprising notifying a user with illuminated indicators that the slow-cooker appliance is powered and that the time is active.	The West Bend programmable slow-cooker includes illuminated indicators in the form of a digital display and LED's to notify the user that the appliance is powered and that the time is active.	literal
Claim 17		
17. The method of claim 13, wherein the temperature and time are set in increments.	The West Bend programmable slow-cooker temperature and time are set in increments. (See Instruction Manual, p. 4, program cooking, steps 2 and 3.)	literal
Claim 19		
19. The method of claim 13, further comprising emitting a sound.	West Bend's programmable slow-cooker emits a sound. (See Instruction Manual, p. 5, Helpful Hints, bullet #3.)	literal

U.S. PATENT NO. 6,740,855 B1

Claim 20	West Bend Programmable Slow-Cooker	Literal/DOE
20. A programmable slow-cooker appliance comprising:		
a heating unit including a bottom and a continuous sidewall extending from said bottom, said bottom and said continuous sidewall defining a well-like chamber, said continuous sidewall including an outer sidewall and an interior sidewall;	West Bend's programmable slow-cooker includes a heating unit (10) having a bottom (15) and a continuous sidewall (17) extending from the bottom to define a well-like chamber.	literal
a heating element mounted to said heating unit and disposed between said outer sidewall and said interior sidewall;	West Bend's programmable slow-cooker includes a heating element mounted to the heating unit and positioned between an outer sidewall and interior sidewall.	literal
a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit;	West Bend's programmable slow-cooker includes a plastic housing (30) in the shape of half an oval fixedly mounted to and projecting outside the sidewall (17) of the heating unit (10).	literal and/or DOE
a programmable circuit positioned within said housing and configured to automatically switch said heating element from a cook mode to a lower temperature warm mode at the end of a set cooking time;	West Bend's programmable slow-cooker includes a programmable circuit including a printed circuit board positioned within the housing (30) and configured to automatically switch the heating element from a cook mode to a lower temperature warm mode at the end of a set cooking time. (See Instruction Manual, p. 4, program cooking, step 3.)	literal and/or DOE
a control panel mounted to said housing and including a user interface connected to said programmable circuit for selecting a cooking temperature and cooking time; and	West Bend's programmable slow-cooker includes a control panel on the front face of the housing and including a digital display and push-buttons thereon (42) mounted to the housing and having a user interface in the form of push-buttons connected to the programmable circuit for selecting a cooking time and temperature. (See Instruction Manual, p. 4, steps 1 and 2.)	literal and/or DOE
a cooking unit removably positioned in said well-like chamber.	West Bend's programmable slow-cooker includes a cooking unit (20) removably positioned in the well-like chamber.	literal

Claim 24	West Bend Programmable Slow-Cooker	Literal/DOE
24. A programmable slow-cooker appliance as described in claim 20 wherein said housing is comprised of a thermoplastic material and said cooking unit is comprised of a ceramic material, said cooking unit being removably positioned in said well-like chamber.	West Bend's programmable slow-cooker includes a housing (30) made of a thermoplastic material and a cooking unit (20) made of ceramic, the cooking unit being removably positioned in the well-like chamber.	literal
Claim 26		
25. A programmable slow-cooker appliance as described in claim 20 wherein said programmable circuit is configured such that a user cannot initially set a lower temperature warm mode.	West Bend's programmable slow-cooker includes a programmable circuit such that the warm mode cannot be initially set as a programmed temperature. (See Instruction Manual, p. 4, program cooking, step 1.)	literal
Claim 27		
27. A programmable slow-cooker appliance as described in claim 20 including a switch operatively associated with said control panel, said programmable circuit being configured such that subsequent pushes of said switch activates different cook modes.	West Bend's programmable slow-cooker includes a switch on the control panel such that subsequent pushes of the switch sets different cook modes. (See Instruction Manual, p. 4, program cooking, step 1.)	literal
Claim 29		
29. A programmable slow-cooker appliance as described in claim 20 wherein said housing includes a thermoplastic portion adjoining and extending into said continuous sidewall of said heating unit.	West Bend's programmable slow-cooker includes a housing (30) having a thermoplastic portion which extends into the sidewall (17) of the heating unit (10).	literal

EXHIBIT D

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

THE HOLMES GROUP, INC.,	:	
	:	
Plaintiff,	:	Civil Action No. 05-CV-11367 WGY
v.	:	(Alexander, M.J.)
	:	
WEST BEND HOUSEWARES, LLC and FOCUS PRODUCTS GROUP, L.L.C.,	:	
	:	
Defendants.	:	

DECLARATION OF PROFESSOR DAVID L. TRUMPER
IN SUPPORT OF PLAINTIFF`S RESPONSE TO DEFENDANT`S
MOTION FOR PARTIAL SUMMARY JUDGMENT OF NON-INFRINGEMENT

I, Professor David L. Trumper make the this declaration based upon my personal knowledge, experience and expertise, and declare as follows:

1. I earned a Ph.D. degree in Electrical Engineering Computer Science from the Massachusetts Institute of Technology ("MIT") in Cambridge, Massachusetts in 1990, a Masters of Science Degree in Electrical Engineering Computer Science from MIT in 1984, and a Bachelor of Science in Electrical Engineering Computer Science from MIT in 1980.

2. I am a full Professor at MIT's Department of Mechanical Engineering, and have been employed by MIT's Department of Mechanical Engineering from September 1993 to the present. I was appointed a full Professor in July 2004. Prior to my appointment as a full Professor, I was an Associate Professor with tenure from July 2000 through June 2004; a Rockwell International Career Development Associate Professor from March 1998 through June

2000 and Assistant Professor from March 1995 through June 1996; and, an Assistant Professor from September 1993 through March 1995.

3. I was an adjunct Professor of Electrical Engineering at the University of North Carolina-Charlotte from 1993 through 1998; and an Assistant Professor of Electrical Engineering prior to my appointment at MIT from 1990 through 1993, also at the University of North Carolina, Charlotte.

4. Prior to my faculty appointments, I held a position of Engineer at the Waters Division of Millipore Corporation from 1986 through 1987; and served as an Engineer at Hewlett-Packard Co. from 1980 to 1982. I was a student employee at Teradyne, Inc. in 1979 while completing my undergraduate studies at MIT.

5. I have served on professional and academic associations and was the President of the American Society of Precision Engineers (ASPE) from 2005-2006; Vice President from 2004-2005; and a member of the ASPE Board of Directors from 2004 to the present. I have also been a Director-at-Large for ASPE from 1995-1998; a Guest Editor for the *Precision Engineering* Journal from 1997-1998; an Associate Editor at *Precision Engineering* from 1998-present. I am also a member of the American Society of Mechanical Engineers (ASME), the Institute of Electrical and Electronic Engineers (IEEE), and the International Academy of Production Engineering (CIRP).

6. I have received numerous awards and honors including the Keenan Award for Innovation in Undergraduate Education 2006; Spira Award for Excellence in Teaching in 2002; 3M Innovation Award in 2001; ASME Leonardo da Vinci Award in 1999; Spira Award for Excellence in Teaching in 1998; Rockwell International Career Development Chair in 1995-

1998; NSF Presidential Young Investigator in 1991-1996; IBM Graduate Fellowship in 1984-1986; and the Hewlett-Packard Master's Fellowship in 1982.

7. Currently, I have eleven (11) issued United States patents, and four (4) pending United States patent applications. I have authored or coauthored twenty-three (23) articles published in refereed journals. I have also published sixty-nine (69) papers in proceedings of refereed conferences.

8. I have served as a professional consultant to a number of companies and law firms.

9. I have conducted research, lectured extensively and taught courses at MIT from 1993 to the present on the subjects of Analysis and Design of Digital Control Systems; Mechatronics; Dynamics and Vibration; Modeling Dynamics and Control; Analysis And Design Of Digital Control Systems; Designing Smart Machines; Systems Modeling And Control.

10. A copy of my *Curriculum Vitae* is attached to this Declaration as Appendix A.

11. I have been asked to review and analyze the structure and operation of the West Bend Housewares, LLC programmable "Crockery" slow-cooker Model No. 843896 as it relates to U.S. Patent Nos. 6,573,483 ("the '483 Patent") and 6,740,855 ("the '855 Patent"), both entitled "Programmable Slow-Cooker Appliance."

12. In performing my analysis, I read the '483 and '855 Patents, I examined the West Bend programmable slow-cooker, identified above, including disassembling a representative device to analyze the internal structure. I also reviewed the Instruction Manual for the West Bend slow-cooker (a copy of which is attached to this Declaration as Appendix B); I also consulted a document entitled: *Slow-cooker Specification Details*, 84386 *Oval Slow-cooker*, Revision A, dated as of November 28, 2004, bearing document Numbers WB 000286- WB

000364; I reviewed the transcript of the Court's *Markman* Hearing conducted on September 27, 2006; and I reviewed the Declaration of Barry N. Feinberg.

13. As part of my analysis and to assist in describing certain features of the West Bend slow-cooker, I consulted with counsel in modifying the labels on the photographs (Photographs 1-11) of the disassembled West Bend Slow-Cooker unit provided as part of Mr. Feinberg's declaration to accurately reflect my understanding and analysis of the device, as well as to assist in my description as set forth in this declaration. I also took my own photographs of the disassembled West Bend Slow-Cooker unit and labeled these as photographs 12-13 according to my analysis of this slow-cooker device (copies of the modified Feinberg photographs, as well as my new photographs, are attached to this Declaration as Appendix C). I used reference numerals in these photographs that most accurately correspond to the description in the specification and drawings of the '483 and '855 Patents, as an illustrative aid in my analysis. I italicized any numerals that I added to label elements not specifically enumerated in the in the '483 and '855 Patents.

14. Upon my reading of the transcript of the Court's *Markman Hearing*, it is my understanding that certain terms of Claim 13 of the '483 Patent have been construed by the Court. In addition, it is my understanding that similar corresponding terms of Claim 20 of the '855 Patent have been construed by the Court, as well. Attached as Appendix D to this Declaration is a Table entitled *Plaintiff's Claims Construction & Comparison Chart*, with four columns. The first (1st) column lists element-by-element the terms that were interpreted by the Court in the *Markman* Hearing on September 27, 2006. Specifically this column lists the terms appearing in Claim 13 of the '483 Patent and Claim 20 of the '855 Patent. The second (2nd) column lists the Court's construction of these terms. The third (3rd) column provides my analysis

of the these terms in view of the specification and drawings of the '483 and '855 Patents, respectively, and indicates my support of the Court's claim construction for each element, and in a few instances my suggestions and citation to the sections of this Declaration providing the basis for proposing certain modifications to the Court's construction of some of the claim terms. In the fourth (4th) column I compare the accused West Bend device, namely, West Bend's Houseware 6 Quart Oval Slow-cooker, Model 84386 to the particular claim elements that were construed.

15. Throughout this Declaration, reference is made to portions of the specification at column and line numbers found in the '483 Patent, as well as reference numerals from the specification and drawings of the '483 and '855 Patents. It is my understanding that the specification and drawings of the '855 Patent are substantially identical to the corresponding specification and drawings of the '483 Patent. Besides the information on the cover page, these patents differ only in the priority information at the top of Column 1, and the claims.

A. Analysis of the term *"a programmable slow-cooker appliance"* from claim 13 of the `483 Patent and Claim 20 of the `855 Patent

16. I have been advised by counsel that West Bend's motion only disputes that certain claim elements are not present in the accused slow-cooker device. I find that each and every non-disputed claim term of Claim 13 of the '483 Patent and Claim 20 of the '855 Patent are present in the West Bend programmable slow-cooker. The first term that is construed in both Claim 13 of the '483 Patent and Claim 20 of the '855 Patent is the phrase "***a programmable slow-cooker appliance***." This term appears in Claim 13, lines 1-2 of the '483 Patent, and in Claim 20, lines 1-2 of the '855 Patent. The Court construed this Claim term for Claim 13 of the '483 Patent as "*a cooking device designed for cooking food at a constant relatively low cooking*

temperature for a relatively long period of time [being], being programmable to operate in a variety of different cooking modes and cooking times," as set forth at page 3, lines 7-12 of the Court's *Markman* Hearing Transcript.

17. The Court decided to take a consistent approach, giving the same construction to the corresponding term in Claim 20; *see*, page 25, lines 8-15 of the Court's *Markman* Hearing Transcript. In analyzing this element of claims 13 and 20, respectively, and the specification of the '483 and '855 Patents, I am in agreement with the Court's approach and interpretation of this element. It is reasonable that the Court interpreted the same element identically, even though the term appeared in different claims of the corresponding Patents. As explained above, the specification and drawings of both Patents are substantially identical. There is no reason why the same term appearing in the claim of the '483 Patent should be interpreted differently in the claim of the '855 Patent.

18. The specification of the '483 Patent supports this construction, in particular see the Abstract (Col. 2 at (57) on the Title page), Background, and the Summary of the Invention as well as the introductory two paragraphs of the Detailed Description of the Drawings and Preferred Embodiments ('483 specification at Cols. 1 and 2). This interpretation is also consistent with my general understanding of slow-cooker appliances as one skilled in the art. In particular, it is my understanding that slow-cookers are designed for cooking food at constant and relatively low cooking temperatures for relatively long periods of time. For example, *see* '483 specification at Col. 2, lines 38-67. The programmable feature of the slow-cooker allows it to operate at any number of different cooking modes and cooking times, for example, see the '483 specification at Col. 5, line 44 through Col. 6, line 20. The same reasoning applies to this term as it appears in Claim 20 of the corresponding '855 Patent.

19. As provided in the fourth (4th) Column of Plaintiff's Claims Construction & Comparison Chart (Appendix D), West Bend's accused device, the West Bend Model No. 84386 6-Quart Electronic Crockery™ Oval Slow-cooker clearly meets the Court's construction of this claim term. In my analysis I consulted the *West Bend Housewares 6-Quart Electronic Crockery™ Cooker Instruction Manual*, which was included with a Model 84386 slow-cooker I purchased from a Wal-Mart store in Plaistow, New Hampshire, and I looked at the slow-cooker prior to its disassembly.

20. The Instruction Manual at pages 4-11 describes the West Bend programmable slow-cooker as a cooking device designed for cooking food at constant, relatively-low cooking temperatures for a relatively long period of time, being programmable to operate in a variety of different cooking modes and cooking times. *Also, see* attached Photos 1-2 (Appendix C) showing the accused West Bend Crockery™ cooker.

21. In particular, pages 7-11 of the Instruction Manual provide slow-cooker recipes for cooking at relatively low cooking temperatures for relatively long periods of time are provided to the purchaser. Additionally, at page 4 of the Instruction Manual, specific programming instructions are provided to the purchaser. As explained at p. 4, the user turns on the device by pressing the on/off button located on the control panel interface. The user then presses the "TEMP" button on the control panel interface to select a cooking temperature. The user then presses the time button to set a desired cooking time. Once the time and temperature have been selected, the user presses the cook button to start the cooking cycle. As stated in the Instruction Manual, when the cooking cycle is complete, the cooker shifts to the warm setting.

22. In my opinion the West Bend Model No. 84386 programmable slow-cooker carries out the steps of Claim 13 of the '483 Patent, and embodies the structure of Claim 20 of

the ‘855 Patent. The West Bend programmable slow-cooker is illustrated in Photographs 1-13 (Appendix C). As shown in Photos 1-4, West Bend’s programmable slow-cooker includes a heating unit (12), and a cooking unit (14) in the form of a ceramic cooking vessel. The heating unit (12) is formed by an interior (17) an outer sidewall (18) and a bottom (16). The interior sidewall (17) and bottom (16) define a well-like heating chamber (20), which is shaped to receive the ceramic cooking unit (14). A heating element (24) is secured to an outer surface of the interior sidewall (17). (*See* Fig. 11 of the ‘483 Patent). The West Bend programmable slow-cooker also includes a programmable control (200), which includes a circuit board housing (210), programmable circuit (300), and a control panel user interface (224) on the front surface of housing (210), specifically on the front surface of the *outer housing shell (210B).* (See Photos 1, 10 and 12). The control panel user interface (224) has buttons for setting a cooking time and cooking temperature and *a Digital Display Window* for viewing light emitting diodes (“LED’s”) and digital readouts for indicating cooking time and cooking temperature. *See,* Photos 1, 6 and 8; and the specification and drawings of the ‘483 Patent, Figs. 1, 2 & 5 and Col. 2, lines 33-63; Col. 3, lines 8-21 & 24-42. Accordingly, it is my opinion that this first claim term for a programmable slow-cooker appliance of both Claim 13 of the ‘483 Patent and Claim 20 of the ‘855 are met by West Bend’s accused device.

B. Analysis of the term ***“a programmable controller”*** in Claim 13 of the ‘483 Patent and **“a programmable circuit”** in Claim 20 of the `855 Patent

23. The Court also construed the term ***“a programmable controller”*** appearing in Claim 13, lines 6-7 of the ‘483 Patent as *“a form of an electrical circuit or circuits including input and output devices which permit an operator to select a cooking temperature and cooking time.” See* page 20, lines 19-22 of the *Markman Hearing* transcript.

24. The Court, consistent with the above interpretation for "a programmable controller," defined the term ***"a programmable circuit"*** appearing in Claim 20, line 12 of the '855 Patent as *"a circuit, including an assemblage of electronic components, which allows the user to program both the temperature and desired time for cooking, and which can automatically change the heating element from a cooking mode to a warm mode once the cooking time has expired…The programmable circuit does not include the heating element, the control panel, displays, and buttons."* This interpretation can be found at page 38, lines 12-17 and 19-21 of the Court's *Markman Hearing* transcript. My analysis of the interpretation of the remainder of the defined claim term *"positioned within said housing"* is provided in detail at paragraphs 37-42 of this Declaration.

25. I am generally in agreement with the Court's interpretation of these terms in Claim 13 of the '483 Patent and Claim 20 of the '855 Patent. It is my understanding that the Court's use of an additional modifying phrase that was not present in its interpretation of the corresponding term in Claim 13 of the '483 Patent, namely, "*and which can automatically change the heating element from a cooking mode to a warm mode once the cooking time has expired*" is taken from the phrase appearing in lines 13-15 of Claim 20, immediately after the construed Claim term, and therefore, in my opinion is not inconsistent or erroneous.

26. Based upon my analysis of the specification and drawings of the '483 Patent, I am of the opinion that the Court's interpretation is consistent and correct for both of these corresponding terms. In the '483 Patent drawings, the programmable circuit (300) is illustrated in Fig. 10 (and 13) and includes input devices and output devices, such as switches, (S1, S2), light emitting diodes (LED's) (D3-D8), thermistor (310), microprocessor (302), Triac (304) and other electronic components (resistors, capacitors, diodes, etc.).

27. These elements of the programmable circuit (300) are disclosed in the specification of at the '483 Patent at Col. 4, lines 48-68 and Col. 5, lines 1-46. The '483 specification at Col. 5, lines 44-46, clearly refers to the "programmable circuitry 300 [which] allows the user to set both the temperature and desired time for cooking." The '483 Patent specification is consistent with this construction for both Claim 13 in the '483 Patent and the corresponding term interpreted for a programmable circuit in Claim 20, line 12, of the '855 Patent.

28. The West Bend Model No. 84386 programmable slow-cooker includes *"a programmable controller"* consistent with the Court's construction of this term for Claim 13 of the '483 Patent and *"a programmable circuit,"* as interpreted by the Court for Claim 20 of the '855 Patent. Specifically, the West Bend programmable slow-cooker includes a programmable electrical circuit (300) as shown in Photographs 10 and 12, including input and output devices, for example a microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) and light emitting diodes (LED's) (D3-D8)), which permit an operator to select a cooking temperature and cooking time. Therefore, it is my opinion that the West Bend programmable slow-cooker includes "*a programmable controller*" as interpreted by the Court for Claim 13, lines 6-7, and *"a programmable circuit"* as this term has been interpreted by the Court for Claim 20, line 12.

C. Analysis of the term **"mounted to a housing fixedly mounted to a heating unit"** in Claim 13 of the '483 Patent and **"a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit"** in Claim 20 of the `855 Patent

29. The last element of Claim 13 of the '483 Patent that was construed by the Court is the phrase ***"mounted to a housing fixedly mounted to a heating unit"*** in lines 7-8 of Claim 13. The Court construed this element as *"[the housing is] mounted to and located on the …outside,*

or at least overwhelmingly or generally outside…of the heating unit." See, the Court's *Markman Hearing* transcript at page 20, lines 24-25; page 21, lines 2-3; and page 24, lines 1-2.

30. The Court also construed the corresponding claim element in Claim 20, lines 10-11 of the '855 Patent, namely, ***"a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit."*** The Court construed this element as *"that it is [a housing] mounted to and largely outside the outer sidewall of the heating unit and extending at least beyond an outer surface of the sidewall of the heating unit." See* the Court's *Markman Hearing* transcript at page 35, lines 5-9.

31. In both instances, the Court indicated that the housing be "*located on the outside, or at least overwhelmingly or generally outside…of the heating unit"* (for Claim 13) or "*largely outside the outer sidewall of the heating unit"* (for Claim 20). However, besides a drawing of the preferred embodiment, provided in Fig. 7 of the '483 Patent, which illustrates the housing (210) protruding outside the outer sidewall (18) of heating unit (12), I am unable to locate any basis for this qualification in the description of the housing or anywhere else in the specification of the '483 Patent. I understand from my discussions with counsel that a claim term does not have to be limited to the preferred embodiment that is described, although the interpretation of the term should be broad enough to encompass, rather than exclude the preferred embodiment. Based on my understanding, it is my opinion that in this case, it appears that the Court's interpretation would unnecessary limit this claim element to a preferred embodiment by quantifying the extent that the housing (210) extends outside of the outer sidewall (18) of the heating unit (12).

32. In both instances, it is my recommendation that the term "**fixedly** mounted to the outer sidewall (18) of the heating unit (12)" be used (the qualifier "fixedly" is in both claim

terms), without what appears to be an unnecessary and somewhat vague qualification. Instead, I recommend using the same phrase in the '483 Patent that was adopted by the Court for Claim 20 of the '855 Patent, namely *"and extending at least beyond an outer surface of the sidewall of the heating unit."* I note that this phrase more accurately defines how the claimed housing is mounted to the heating unit, without including an unnecessary and somewhat redundant qualification.

33. Accordingly, it is my recommendation that the Court modify its claim construction for these corresponding terms in both Claim 13 of the '483 Patent and Claim 20 of the '855 Patent, as follows:

"a housing (210) **fixedly** mounted to *[and largely outside]* the outer sidewall (18) of the heating unit (12) and extending at least beyond an outer surface of the sidewall (18) of the heating unit (12)."

(The bold and underline is added to show a term to be included, while the bracketing and italics are provided to identify what is to be deleted from the construction of the claim element).

34. The West Bend Model No. 84386 programmable slow-cooker includes this element of Claim 13, lines 7-8 of the '483 Patent, namely, ***"mounted to a housing fixedly mounted to a heating unit,"*** and the corresponding element in Claim 20, lines 10-11 of the '855 Patent, namely, ***"a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit."***

35. Specifically, as shown in Photos 4-6, 8 and 10, the West Bend programmable slow-cooker includes a printed circuit board housing (210) formed by *an inner housing shell (210A) (white plastic) and an outer housing shell (210B).* The control panel user interface (224) is located on the front face of the *outer housing shell (210B) (black plastic).* The outer sidewall

(18) of the West Bend programmable slow-cooker has a cutout to accommodate the printed circuit board housing (210) enclosure and provide access for wires connecting to electronic components of the programmable circuit (300) mounted within the heating unit (12). (In particular, see Photos 10 and 12). The *inner housing shell (210A)* is attached to the inner surface of outer sidewall (18) by screws which are fastened from the outside of the heating unit outer sidewall (18). The *outer housing shell (210B)* covers the *inner housing shell (210A)* and is affixed to the exterior of the outer sidewall (18) of the heating unit (12) by screws fastened from the inside of the outer sidewall (18). The *inner housing shell (210A)* and *outer housing shell (210B)* having the control panel user interface (224) on its front face form the circuit board housing (210) enclosure, which is mounted to and located on the outer sidewall (18) of the heating unit (12).

36. As can be seen in Photos 1, 2, 5, 10 and 12, both the *inner housing shell (210A)* and the *outer housing shell (210B)* are fixedly mounted by screws to, and extend beyond, the outer surface of the sidewall (18) of the heating unit (12). The entire *outer housing shell (210B)* extends outwardly from the outer side wall. Accordingly, it is my opinion that the West Bend Model No. 84386 programmable slow-cooker includes all limitations of this claim element, as interpreted by the Court. It is also my opinion that the West Bend Model No. 84386 programmable slow-cooker includes all of the limitations of this claim element consistent with my recommendation for modification of the Court's construction for this Claim element.

37. I have been advised by counsel that if the Court should find that the West Bend structure is not literally encompassed by the claim (i.e. Claim 13 of the '843 Patent and Claim 20 of the '855 Patent), that the West Bend device could still infringe under the doctrine of equivalents. West Bend's portion of the housing (210) within the heating unit (12), is merely an

insubstantial change which accomplishes the function of the invention (i.e., programming a cooking time and temperature and automatically changing the heating unit temperature from a cooking mode to a lower temperature warm mode at the end of a selected time) in substantially the same way to achieve substantially the same result.

38. The way to achieve the function is by providing a circuit (300) which can program a cooking time and temperature. Additionally, the circuit is (300) configured to automatically change power to the heating element to switch from a cooking mode to a lower temperature warm mode at the expiration of a set cooking time. Clearly, West Bend's device includes a circuit (300) to accomplish these functions. With respect to the housing (210), West Bend's device includes a housing (210) fixedly mounted to the heating unit (12). West Bend's housing (210) or enclosure includes portions which extend both into the heating unit (12) as well as projecting outwardly beyond the outer surface of the outer sidewall (18) of the heating unit (12). Accordingly, should the Court require the housing to be "overwhelmingly" or "largely" outside of the outer sidewall (18) of the heating unit (12), the West Bend device would still infringe under the doctrine of equivalents since the housing accomplishes the function of providing an enclosure (210) for the programmable controller (300) in substantially the same way to achieve substantially the same result of the claim limitation, as construed by the Court.

39. Should the Court hold that the housing limitation is not literally present, any differences in the West Bend structure are merely insubstantial and do not avoid infringement under the doctrine of equivalents. The function of the housing (210) is to provide an enclosure for at least a portion of the programmable circuit. The way in which this function is accomplished is by providing housing portions which are fixedly mounted to the outer sidewall of the heating unit to form the enclosure (210). The result is substantially the same since the

enclosure (210) projects outwardly beyond an outer surface of the sidewall (18). The Court has suggested that the housing project "largely outside," the outer sidewall; however, this limitation does not appear in either the claim language or the specification. Accordingly, West Bend's accused structure, if not literally present, is clearly an insubstantial change which would constitute an infringement under the doctrine of equivalents.

D. Analysis of the term ***"a programmable circuit positioned within said housing"*** in Claim 20 of the `855 Patent

40. The last claim element of '855 Patent that was construed by the Court is the phrase ***"a programmable circuit positioned within said housing"*** in line 12 of Claim 20. As discussed at paragraph 24, above, the Court construed the first part of this element, namely, ***"a programmable circuit***" as *"a circuit, including an assemblage of electronic components, which allows the user to program both the temperature and desired time for cooking, and which can automatically change the heating element from a cooking mode to a warm mode once the cooking time has expired…The programmable circuit does not include the heating element, the control panel, displays, and buttons."* This interpretation can be found at page 38, lines 12-17 and 19-21 of the Court's *Markman Hearing* transcript.

41. The Court construed the second part of this element of Claim 20, line 12 of the '855 Patent, namely, the locator term ***"positioned within said housing***" as *"The circuit, not just a portion of the circuit, is positioned within the housing."* This interpretation can be found at page 38, lines 17-19 of the Court's *Markman Hearing* transcript.

42. The '483 Patent specification describes the programmable circuit (300), illustrated in Figs. 10 and 13, to include input devices and output devices, such as switches, (S1, S2), LED's (D3-D8), a thermistor (310), microprocessor controller (302), Triac (304) and other electronic components (resistors, capacitors, diodes, transistors, etc.). See the '483 Patent

specification at Col. 4, lines 48-68 and Col. 5, lines 1-46. The '483 Patent specification states that some components of the programmable circuit (300) are connected externally of the printed circuit board (254). For example, the '483 Patent specification describes the Triac 304 as an electronic component of the programmable circuit (300), which switches power applied to the heating elements, as preferably "mounted to one of the mounting holes… of the heat sink 256." *See* '483 Patent specification at Col. 5, lines 29-36; *see also* Figs. 10, 11 and 13. The '483 Patent specification further states that "[m]ost of the other components of the [programmable] circuit 300 are mounted on a conventional printed circuit board 254." The '483 Patent at Col. 5, lines 38-40. Similarly, the specification states, "[t]he temperature of the cooking appliance is measured using a thermistor 310, which is connected externally of the circuit board to the underside of the bottom of the heating chamber." The '483 Patent specification at Col. 5, lines 22-25.

43. The '483 Patent specification also makes clear that the programmable circuit (300) illustrated and described is merely exemplary and that "one skilled in the art will recognize that… many other components may be substituted to achieve the functions described herein". The '483 Patent at Col. 4, lines 54-57; Col. 5, lines 16-19. Therefore, as one skilled in the art of electronic digital control and design, I understand that the disclosure of the '483 and '855 Patents clearly contemplates and discloses that various circuit components may be used in various arrangements both inside and outside of the printed circuit board housing (210) to achieve the desired functions of the programmable circuit (300).

44. In addition, as one skilled in the art of electronic digital control and design, it is my opinion that the '483 and '855 Patents disclose that some of the programmable circuit is located on the circuit board (254) positioned within the housing (210) affixed to the outer

sidewall of the cooking unit, but that other components of the programmable circuit may be located outside of the housing (210). In fact, to operate properly, the thermistor (310) component of the programmable circuit must be located outside the circuit board housing. Therefore, I recommend modifying the Court's claim construction for this Claim element by removing the phrase [*The circuit, not just a portion of the circuit, is positioned within the housing]*, so that the term ***"a programmable circuit positioned within said housing"*** in Claim 20, line 12 of the '855 Patent is construed as:

"a circuit (300), including an assemblage of electronic components (microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) & light emitting diodes (LED's)(D3-D8)) which allows the user to program both the temperature and desired time for cooking and which can automatically change the heating element (24) from a cooking mode to a warm mode once the set cooking time has expired. *[The circuit, not just a portion of the circuit, is positioned within the housing.]* **Components of the circuit (300) are mounted on a printed circuit board (254) inside the housing (210).** The programmable circuit (300) does not include the heating element (24), the control panel (220), displays (57), and buttons (264, 266)."

(The bold and underlined text is added to show terms to be included, while the bracketing and italics are provided to identify what is to be deleted from the construction of the claim element).

45. The West Bend Model No. 84386 programmable slow-cooker includes this element of Claim 20, lines 12 of the '855 Patent, namely, ***"a programmable circuit positioned within said housing."*** As shown in Photos 4, 5, 8-10, 12 and 13 discussed in paragraph 28 above, the West Bend programmable slow-cooker includes ***"a programmable circuit,"*** namely, "a circuit (300), including an assemblage of electronic components (microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) & light emitting diodes (LED's)(D3-D8))

which allows the user to program both the temperature and desired time for cooking and which can automatically change the heating element (24) from a cooking mode to a warm mode once the set cooking time has expired. Components of the circuit (300), namely switches (S1-S2) & light emitting diodes (LED's)(D3-D8)), surface mounted resistors, capacitors and electronic logic devices (IC's) connected to the other components of the programmable circuit (300) with traces on the surface of the printed circuit board (254) and by external wiring, which allows the user to program both the temperature and desired time for cooking are mounted on a printed circuit board (254) inside the housing (210).

46. Consistent with the description in the '483 (and '855) Patent specifications, in the West Bend Crockery slow-cooker the thermistor (310) and Triac (304) are both mounted externally to the printed circuit board (254). (See Photos 10 and 12). Additionally, these elements are positioned within the interior space of the heating unit (12), located outside of the housing (210). The '483 Patent specification states that some components of the programmable circuit (300) are connected externally of the circuit board (254). For example, the Triac (304), in the West Bend programmable slow-cooker, is an electronic component of the programmable circuit (300), which switches power applied to the heating elements and is mounted using screws to mounting holes of a heat sink (256). The Triac (304) is described in the '483 Patent specification as preferably "mounted to one of the mounting holes… of the heat sink 256." *See* '483 Patent specification at Col. 5, lines 29-38; *see also* Figs. 10, 11 and 13 of the '483 Patent. Similarly, the specification states, "[t]he temperature of the cooking appliance is measured using a thermistor (310), which is connected externally of the circuit board to the underside of the bottom of the heating chamber." *See* '483 Patent specification at Col. 5, lines 22-25.

47. As shown in Photos 8-10 and 12-13, the West Bend programmable slow-cooker includes components of the programmable circuit (300) on printed circuit board (254) provided inside printed circuit board housing (210) and other components of the programmable circuit (300), including a microprocessor controller (302), resistors diodes and capacitors on a *second printed circuit board (255)* in a *second printed circuit board enclosure (211)*, which is connected by wires to printed circuit board (254) and to Triac (304). The *second printed circuit board (255)* is mounted in a *second printed circuit board enclosure (211)* and is located on the underside of the heating unit (12). The thermistor (310) is connected by wires to the printed circuit board (254). The programmable circuit (300) does not include the heating element (24), the control panel (220), displays (57), and buttons (264, 266). Accordingly, it is my opinion that the West Bend Model No. 84386 programmable slow-cooker includes all limitations of this claim element, as interpreted by the Court and consistent with my recommendation for modifying the Court's construction for this claim element.

48. As shown in Photographs 8-10 and 11-12, the West Bend programmable circuit (300) includes two printed circuit boards (254 and *255*), connected by wires as well as components mounted external to the printed circuit boards (254 and *255*). One of the printed circuit boards (254) of the programmable circuit is positioned within the housing. The other printed circuit board (*255)* is mounted within the heating unit (12). The thermistor (310) and Triac (304) are both mounted externally to the printed circuit boards (254 and *255)*, within the heating unit interior space. Accordingly, under the Court's present construction, which is believed to be in error, requiring the circuit, not just a portion of the circuit be positioned within the housing, infringement can be found under the doctrine of equivalents.

49. West Bend's programmable circuit (300) is not entirely within the housing;

however, a printed circuit board (254) including electronic components which permit a user to select a cooking time and temperature is positioned within the housing (210). The circuit (300) as a whole, including both printed circuit boards (254 and *255*), the thermistor (310) and Triac (304), works in exactly the same way as the programmable circuit (300) disclosed in the '483 and '855 Patents. The only difference is that some electronic components are provided on a *second printed circuit board* (*255*) located within the heating unit rather than the housing. Splitting the printed circuit board components of the programmable circuit (300) into two circuit boards which are connected by wires is an insubstantial change readily apparent to a person of ordinary skill in the art. The West Bend programmable circuit (300) performs all the claimed functions (selecting a cooking time and temperature and automatically changing the heating element from a cook mode to a warm mode once the set time has expired) in substantially the same way to achieve substantially the same result. Merely splitting one circuit board component of the programmable circuit into two circuit boards connected by wires does not change the function, way, or result of the circuit (300). Thus, the West Bend device infringes Claim 20 as construed by the Court under the doctrine of equivalents.

E. **The Feinberg Declaration**

50. I have carefully reviewed the Feinberg Declaration and disagree with certain statements made by Dr. Feinberg. For example, in identifying components using the terminology from the '483 and '855 Patents, Dr. Feinberg incorrectly identifies a single component of the programmable circuit, namely, a microprocessor controller (302) as the "Programmable Controller." Contrary to Dr. Feinberg's statement, I agree with the Court's determination on claim construction that the programmable controller is a form of electrical circuit or circuits (300) including input and output devices which permit an operator to select a

cooking temperature and cooking time.

51. I also disagree with Dr. Feinberg's characterization of the *outer housing shell (210B)* as the "Control Panel," which does not form a part of the circuit board housing (210) defined in the '483 patent specification and claims at issue. The disclosure of the '483 Patent, describes the control panel user interface (254) as being located on the front surface of the housing (210) (*see* Figs 5 and 6, and Col 3, lines 20-21). In West Bend's slow-cooker the control panel user interface (254) is located on the outer surface of *outer housing shell (210B).* The '483 Patent shows the circuit board housing (254) as an enclosure. The *outer housing shell (210B),* which Dr. Feinberg identifies as the "Control Panel" along with the *inner housing shell (210B),* which he calls the "Plastic Housing for First Circuit Board" form the circuit board housing (210) enclosure. The *inner and outer housing shell (210A and 210B)* sections are each affixed by screws to the outer sidewall (18) of the heating unit (12) and enclose the printed circuit board (254) within the housing (210).

52. Since Dr. Feinberg starts with the incorrect premise that the programmable controller consists solely of the microprocessor, his conclusion at paragraph 12 that the programmable controller lies "entirely inside the heating unit" is incorrect. Likewise, his statements in paragraph 13 are incorrect since they rely on the incorrect presumption that the microprocessor is the only component of the programmable controller, which is contrary to the teaching in the specification of the '483 and '855 Patents, as well as the Court's claim construction.

I declare under penalty of perjury that the foregoing is true and correct and, as to matters stated to be alleged on information and belief, I believe them to be true.

Executed this 12 day of October, 2006

David L. Trumper

David L. Trumper Ph.D.

APPENDIX A

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

School of Engineering Faculty Personnel Record

Date: August, 2006

Name: David L. Trumper
Department: Mechanical Engineering

1. Date of Birth: August 24, 1957

2. Citizenship: USA

3. Education:

School	Degree	Date
Massachusetts Institute of Technology	B.S. - EECS	June 1980
Massachusetts Institute of Technology	M.S. - EECS	June 1984
Massachusetts Institute of Technology	Ph.D. - EECS	Sept. 1990

4. Title of Thesis for Most Advanced Degree:

   Magnetic Suspension Techniques for Precision Motion Control

5. Principal Fields of Interest:

   Mechatronics; Precision Engineering; Design of Precision Electromechanical Systems; Applications of Continuous- and Discrete-Time Control; Instrumentation; Electromechanics and Electric Machines; Magnetic Suspensions and Bearings; Control of Fluid Systems; Analog Circuit Design; Analog and Digital Signal Processing

6. Name and Rank of Other M.E. Faculty in Same Field:

   Stephen Dubowsky, Professor
   Ian Hunter, Professor
   Alexander Slocum, Professor
   Kamal Youcef-Toumi, Professor
   Sanjay Sarma, Associate Professor

7. Name and Rank of Faculty of Other Departments in Same Field:

   Jeffrey Lang, Professor of Electrical Engineering and Computer Science

Markus Zahn, Professor of Electrical Engineering and Computer Science
Steven Leeb, Professor of Electrical Engineering and Computer Science

8. Non-MIT Experience (including military service):

Employer	Position	Beginning	Ending
Teradyne, Inc.	Student employee	1979	1979
Hewlett-Packard Co.	Engineer	1980	1982
Waters Division of Millipore	Engineer	1986	1987
University of North Carolina - Charlotte	Assistant Professor of Electrical Engineering	1990	1993
University of North Carolina - Charlotte	Adjunct Professor of Electrical Engineering	1993	1998

9. History of MIT Appointments:

Rank	Beginning	Ending
Assistant Professor	Sept. 1993	March 1995
Rockwell International Career Development		
Assistant Professor	March 1995	June 1996
Associate Professor	July 1996	Feb. 1998
Associate Professor	March 1998	June 2000
Associate Professor with tenure	July 2000	June 2004
Professor	July 2004	present

10. Industrial Consulting Record:

Firm	Beginning	Ending
Berlyn Corp.	1987	1987
Waters Div. of Millipore	1989	1989
Boreas, Inc.	1989	1991
GCA Unit Of General Signal	1990	1993
Lincoln Laboratory, Control Systems Group	1990	1997
Sematech	1992	1993
Anorad Corp.	1993	2000
Polaroid Corporation	1993	2000
Summit Technology	1994	2000
Electroglas, Inc.	1995	1998
Integrated Solutions, Inc.	1995	1999
Amex Inc.	1995	1997
Applied Materials Technology, Inc.	1995	1996
Synkinetics, Inc.	1997	1997

Silicon Valley Group, Inc.	1997	1997
3M Corp.	1999	2001
Landis Gardner	2000	2001
Ultratech Stepper	2000	2001
Lawrence Livermore Laboratory	2000	2000
FluidSense Corp.	2001	2001
Sughrue Mion	2001	2002
AGFA Corp.	2001	2002
Codem Systems, Inc.	2002	2002
Hale and Dorr	2002	2004
Raven Technologies	2005	2005
Sughrue Mion	2005	2006
Lincoln Laboratory, Control Systems Group	2004	present
Greenberg Traurig	2006	2006
Aerotech	2005	present
ASML	2006	present

11. Department and Institute Committees, Other Assigned Duties:

Activity	Beginning	Ending
LMP Space Committee	1994	1999
Graduate Policy Committee	1994	1999
Graduate Admissions Committee	1994	2000
Design Faculty Search Committee	1995	1995
Manufacturing Faculty Search Committee	1995	1995
IAP Coordinator	1996	2000
EIP Coordinator	1997	2000
Ad Hoc Tenure Committee	2000	2000
Committee on Academic Performance	2001	2002
Ligo Oversight Committee	2002	2002
Sophomore Registration Officer	2004	2005
Junior Registration Officer	2005	present
Department Education Council	2005	present
Undergraduate Education Committee	2005	present
School of Engineering Committee on Underrepresented Minority Graduate Student Enrollment	2005	present
Graduate Admissions Committee	2006	present

12. Professional Service:

Activity	Date
ASPE Tutorial Course "Perspectives on PID Control," Santa Fe,	October, 1991
Panel review member National Science Foundation Small Business Incentives for Research (SBIR) Proposals, Washington, D.C.	January 1992
Steering committee member 3rd International Symposium on Magnetic Bearings, Alexandria, VA	July 1992
Session chairman 3rd International Symposium on Magnetic Bearings, Alexandria, VA	July 1992
Panel review member National Science Foundation, Div. of Design and Manufacturing Systems, unsolicited proposals, Washington, D.C.	January 1993
Steering committee member 2nd International Symposium on Magnetic Suspension Technology, Seattle, WA	July 1993
Steering committee member 4th International Symposium on Magnetic Bearings, Zurich, Switzerland	August 1994
ASPE Tutorial Course "Actuators and Bearings for Precision Rectilinear Motion," Cincinnati, OH	Oct. 3, 1994
Industrial Tutorial Course "Applied Control System Design", Summit Technology, Waltham, MA	December 1994
MIT Summer Session Course "Digital Control System Design for Applications," MIT	June 19-23, 1995
ASPE Tutorial Course, "Actuators and Bearings for Precision Rectilinear Motion," Austin, TX	October 1995

Session Chairman, ASME International Mechanical Engineering Congress and Exhibition, San Francisco, CA	November 1995
Session Chairman, 3rd International Symposium on Magnetic Suspension Technology, Tallahassee, FL	December 1995
Panel Review Member, Career Awards, National Science Foundation Washington, DC	December 1995
Steering committee member 3rd International Symposium on Magnetic Suspension Technology, Tallahassee, FL	December 1995
Director at Large, American Society for Precision Engineering	December 1995- December 1998
Session Chairman, IEEE Intermag Conference, Seattle, WA	April 1996
Steering committee member 5th International Symposium on Magnetic Bearings, Kanazawa, Japan	August 1996
Session Chairman, 5th International Symposium on Magnetic Bearings, Kanazawa, Japan	August 1996
ASPE Tutorial Course, “Actuators and Bearings for Precision Rectilinear Motion,” Monterey, CA	November 1996
Panel Review Member, Unsolicited Proposals, National Science Foundation Washington, DC	April 1997
MIT Summer Session Course, “Digital Control System Design for Applications,” MIT, June 16-20, 1997	June 1997
ASPE Tutorial Course, “Actuators and Bearings for Precision Rectilinear Motion,” Norfolk, VA	October 1997
Steering committee member 4th Int. Symposium on Magnetic Suspension Technology, Gifu, Japan	November 1997
Panel Review Member, Unsolicited Proposals, National Science Foundation, Washington, DC	June 1998

Co-chairman, 6th International Symposium on Magnetic Bearings, MIT, Cambridge, MA, August 5-7, 1998.	August 1998
Member, Organizing and Technical Program Committee, ASPE 1998 Annual Meeting, St. Louis, MO, Oct. 1998.	October 1998
Guest editor, *Precision Engineering,* American Society for Precision Engineering	1997-1998
ASPE Tutorial Course, "Actuators and Bearings for Precision Rectilinear Motion," St. Louis, MO	October 1998
Associate Editor, *Precision Engineering,* American Society for Precision Engineering	1998 – present
MIT Summer Session Course, "Digital Control System Design for Applications," MIT, June 21-25, 1999.	June 1999
ASPE Tutorial Course, "Precision Mechatronics," Monterey, CA	October 1999
Reviewer, NSF proposals, DMII Div.	November 1999
MIT Summer Session Course, "Digital Control System Design for Applications," MIT, July 31-Aug. 4, 2000.	August 2000
Member, International Advisory Committee, 7th International Symposium on Magnetic Bearings, August 24-25, 2000, Swiss Fed. Inst. of Tech., Zurich.	August 2000
Member, Steering Committee, Mechatronics 2000	September 2000
ASPE Tutorial Course, "Precision Mechatronics," Scottsdale, AZ	October 2000
Co-chairman, ASPE Spring Topical Meeting: Control of Precision Systems	April 2001
MIT Summer Session Course, "Digital Control System Design for Applications," MIT, July 30-Aug. 3, 2001.	August 2001
Member, Editorial Board, *Mechatronics*, pub. by Elsevier Science	1999-present

Member, International Advisory Committee, 6th International Symposium on Magnetic Suspension Technology	October 2001
Member, International Advisory Committee, Third International Symposium on Linear Drives for Industry Applications	October 2001
ASPE Tutorial Course, "Precision Mechatronics," Crystal City, Washington, DC	November 2001
Review panel, NSF proposals, DMII Div.	April 2002
Member, Steering Committee, Euspen 3rd International Conf. Eindhoven University of Technology, Netherlands	May 2002
Member, International Scientific Advisory Board, MOVIC 2002 Saitama, Japan.	August, 2002
University of Delft Summer Session Course, "Digital Control System Design for Applications," University of Delft, Netherlands, June 17-21, 2002.	June 2002
Member, International Advisory Committee, 8th International Symposium on Magnetic Bearings, August 26-28, 2002, Mito, Japan.	August 2002
Conference section organizer, National Academy of Engineering German-American Frontiers of Engineering Conference	May 2003
ASPE Tutorial Course, "Precision Mechatronics, Parts 1 and 2," Portland, OR	October 2003
Co-Chairman, ASPE Spring Topical Meeting, "Control of Precision Systems," MIT, Cambridge, MA.	April 2004
Co-chairman, 9th International Symposium on Magnetic Bearings, University of Kentucky, Lexington, KY.	August 2004
ASPE Tutorial Course, "Precision Mechatronics, Parts 1 and 2," Orlando, FL	October 2004
Reviewer, NSF proposals, DMII Div.	May 2005
International Steering Committee, Linear Drives for Industry Applications, Awaji Island, Japan	September 2005

ASPE Tutorial Course, "Precision Mechatronics, Parts 1 and 2," Norfolk, VA	October 2005
Editorial Advisory Board, *Mechatronics*, International Federation of Automatic Control	2000-2005
Organizing Committee, ASPE Spring Topical Meeting, "Challenges at the Intersection of Precision Engineering and Vacuum Technology", Pittsburgh, PA	April 2006
International Steering Committee, International Conference on Precision Engineering, Kobe, Japan	August 2006
ASPE President	2005
Member, ASPE Board of Directors	2004-present
University of Delft Summer Session Course, "Digital Control System Design for Applications," University of Delft, Netherlands, June 13-16, 2006.	June 2006

13. Awards and Honors Received:

Award	Date
Hewlett- Packard Master's Fellowship	1982
IBM Graduate Fellowship	1984 - 1986
NSF Presidential Young Investigator	1991 - 1996
Rockwell International Career Development Chair	1995 – 1998
Spira Award for Excellence in Teaching	1998
ASME Leonardo da Vinci Award	1999
3M Innovation Award	2001
Spira Award for Excellence in Teaching	2002
Keenan Award	2006

14. Current Organization Membership:

Organization

Corresponding Member, International Institution for Production Engineering Research (CIRP)
Institute of Electrical and Electronics Engineers (IEEE)
American Society for Precision Engineering (ASPE)
Director-at-Large, 1995-1998
Guest editor, *Precision Engineering,* 1997-1998
Associate Editor, *Precision Engineering,* 1998-present
Vice-President, 2004-2005
President, 2005-2006
American Society of Mechanical Engineers (ASME)

15. Patents and Patent Applications Pending:

U.S. Issued:

1. Trumper, D.L. and Dourdeville, T., "Fluid Composition and Volumetric Delivery Control," #4,767,279, August 30, 1988.

2. Trumper, D.L., "Bearing for Use in High Resolution Precision Control Device," #5,157,296, October 20, 1992. Licensed to Ultratech Stepper.

3. Trumper, D.L., "Magnetic Positioning Device," #5,196,745, March 23, 1993. Licensed to Ultratech Stepper.

4. Trumper, D.L., "Bearing for Use in High Resolution Precision Control Device," #5,294,854, March 15, 1994. Licensed to Ultratech Stepper.

5. Trumper, D.L., Kim, Won-jong, Williams, Mark E., "Magnetic Arrays," #5,631,618, May 20, 1997.

6. Trumper, D.L., Williams, M.E., "Positioner with Long Travel in Two Dimensions," #5,699,621, December 23, 1997.

7. Trumper, D.L. and Kim, W.-J., "Magnetic Positioner Having a Single Moving Part," #6,003,230, December 21, 1999.

8. Trumper, D.L. and Schwartz, L., "Magnetic Actuator With Long Travel in One Direction," #6066998, May 23, 2000.

9. Trumper, D.L., and Liebman, M.J., "Method and Apparatus for Cooling Current Carrying Coil," #6262503, July 17, 2001.

10. Trumper, D.L. and Ludwick, S.J., "Precision High Speed Turning Machine," #6237452, May, 2001.

11. Trumper, D.L., and Konkola, P., "Methods and Apparatus Involving Selectively Tailored Electromagnetic Fields," #6316849, November, 2001.

U.S. Pending

1. Trumper, D.L., and Kendale, Amar, "Mechanisms and Control Techniques for Soft Contact Lithography," provisional application submitted January 11, 2002; full application submitted January 10, 2003.

2. Montesanti, R., and Trumper, D.L., "Micro-Rotary Fast Tool Servo," application submitted June, 2003.

3. Montesanti, R., and Trumper, D.L., "Flux-Steering Rotary Fast Tool Servo," application submitted September, 2003.

4. Lu, X-L., and Trumper, D.L., "Ultrafast Tool Servos", application submitted October, 2004.

16. Professional Registration:

None.

17. Major New Products, Processes, Designs, or Systems (most developed in collaboration with graduate students):

Developed novel pump flow control method, used in liquid chromatography pumping systems. Used in commercial product line of Waters Chromatography for interfacing liquid chromatographs with mass spectrometer detectors. Improved flow control by a factor of 50 over previous commercial device. Received my first patent for this work.

Designed world's highest resolution magnetic suspension stage (position resolution of 50 picometers RMS). First scanning tunneling microscope images taken with a magnetic suspension stage. Work extended to include levitation with linear motors in oil, greatly extending travel range of stage.

Designed family of magnetic suspension lithography stages; the first use of this technology for photolithography systems. Technology licensed to US supplier of lithography equipment.

Designed new class of magnetic suspension actuators for mirror scanning in FTIR spectrometers using novel *super-hybrid* magnetic circuit topology.

Designed novel fast-tool servomechanism and control strategy for diamond turning of lenses for the ophthalmic industry. Rotary direct-drive tool axis achieves better than 50 g accelerations on the tool, over a travel of 40 mm, with micrometer-scale positioning accuracy. We can thereby produce eyeglass lenses with 10 times better form accuracy in half the time as compared with present commercial equipment.

Designed new cooling methods for linear motors which allow a factor of five increase in force density over conventional designs.

Developed novel low-fringing-field linear motors for use in electron beam lithography. Demonstrates for first time feasibility of using linear motors in low-fringing-field applications.

Designed and experimentally demonstrated new class of machines for implementing automation of microcontact printing, and for automated production of microcontact stamps.

Designed new class of electromagnetically-driven fast tool servos as replacements for piezoelectically-driven devices. Experimentally demonstrated bandwidth in excess of 20 kHz, with tool acceleration of 500 g's. Acceleration up to 2000 g within design capabilities.

1. Teaching Record

Term	Subject Number	Title	Role	Course Type	Course Evaluation Survey Given
FT 91	EEGR 2111 (UNCC)	Circuit Theory	Instructor	UG	N.A. (not MIT)
ST 91	EEGR 4112 (UNCC)	Digital Control System Design	Instructor	UG	N.A. (not MIT)
FT 92	EEGR 4111 (UNCC)	Classical Control System Design	Instructor	UG	N.A. (not MIT)
ST 92	EEGR 5112 (UNCC)	Nonlinear Control Design	Instructor	G	N.A. (not MIT)
ST 92	EEGR 6090 (UNCC)	Special Topics: Electromechanical Systems	Instructor	G	N.A. (not MIT)
FT 93	EEGR 4111 (UNCC)	Classical Control System Design	Instructor	UG	N.A. (not MIT)
ST 93	EEGR 4112 (UNCC)	Digital Control System Design	Instructor	UG	N.A. (not MIT)
FT 93	2.73	Design Projects	Recitation Instructor	UG	Yes
ST 94	2.171	Analysis and Design of Digital Control Systems	Instructor	H	Yes
FT 94	2.02	Introduction to System Dynamics	Co-Instructor	UG	Yes
ST 95	2.171	Analysis and Design of Digital Control Systems	Instructor	H	Yes
FT 95	2.737	Designing Smart Machines	Instructor	H	Yes
ST 96	2.737	Designing Smart Machines	Instructor	H	Yes
FT 96	2.737	Mechatronics	Instructor	H	Yes
ST97	2.171	Analysis and		H	Yes

		Design of Digital Control Systems			
Term	Subject Number	Title	Role	Course Type	Course Evaluation Survey Given
FT97	2.737	Mechatronics	Instructor	H	Yes
ST98	2.171	Analysis and Design of Digital Control Systems	Instructor	H	Yes
FT98	2.737	Mechatronics	Instructor	UG	Yes
ST99	2.737	Mechatronics	Instructor	UG	Yes
FT99	2.737	Mechatronics	Instructor	UG	Yes
ST00	2.003	Systems Modeling and Control I	Co-instructor	UG	Yes
ST00	2.171	Analysis and Design of Digital Control Systems	Instructor	H	Yes
FT00	N/A	family leave	N/A	N/A	N/A
ST01	N/A	sabbatical	N/A	N/A	N/A
FT01	2.003	Modeling Dynamics and Control I	Instructor	UG	Yes
ST02	2.003	Modeling Dynamics and Control I	Lab Instructor	UG	Yes
FT02	2.003	Modeling Dynamics and Control I	Instructor	UG	Yes
ST03	2.003	Modeling Dynamics and Control I	Instructor	UG	Yes
ST03	2.998	Advanced topics: Digital Control	Instructor	G	No
FT 03	2.003	Modeling Dynamics and Control I	Instructor	UG	No
ST04	2.003	Modeling Dynamics and Control I	Recitation Instructor	UG	Yes
FT04	2.003	Modeling Dynamics and Control I	Instructor	UG	Yes

ST 05	2.003	Modeling Dynamics and Control I	Instructor	UG	Yes
FT 05	2.003	Dynamics and Vibrations	Instructor	UG	Yes
ST 06	2.737	Mechatronics	Instructor	G	Yest
FT 06	2.171	Analysis and Design of Digital Control Systems	Instructor	G	

2. Other Educational Contributions
   a) Developed new syllabus and associated lab experiences for revised offering of 2.003 Modeling Dynamics and Control I. Supervised graduate students to design and implement 10 new sets of lab hardware experiments, with associated software, electronics, and supporting documentation. Each experiment implemented on 12 lab stations.
   b) Implemented web site documenting new 2.003 course offering and laboratories. Web site includes details of lab operation and supporting information to allow other faculty to duplicate lab experiments.

Record of Research Funding for
David L. Trumper

1. Books:
   None.

2. Papers in Refereed Journals:

   2.1. Trumper, D.L., "An Electronically-Controlled Pressure Regulator," *ASME Journal of Dynamic Systems, Measurement, and Control*, Vol. 111, No. 1, March 1989, pp. 75-82.

   2.2. Williams, M.E. and Trumper, D.L., "Magnetic Bearing Stage for Photolithography," *CIRP Annals*, Vol. 42/1/1993, pp. 607-610. **

   2.3. Poovey, T., Holmes, M., and Trumper, D.L., "A Kinematically-Coupled Magnetic Bearing Test Fixture," *Precision Engineering*, vol. 16, No. 2, April 1994, pp. 99-108. **

   2.4. Holmes, M.L., Trumper, D.L., and Hocken, R.J., "Atomic-Scale Precision Motion Control Stage (The Angstrom Stage)," *CIRP Annals*, Vol. 44/1/1995, pp. 455-460. **

   2.5. Holmes, M.L. and Trumper, D.L., "Magnetic/Fluid Bearing Stage for Atomic-Scale Motion Control," *Precision Engineering*, vol. 18, No. 1, Jan. 1996, pp. 38-49.**

   2.6. Trumper, D. L., Kim, W-J, Williams, M. E., "Design and Analysis Framework for Linear Permanent Magnet Machines," *IEEE Transactions on Industry Applications,*Vol. 32, No. 2, March/April 1996, pp. 371-379.**

   2.7. Ludwick, S.J., Trumper, D.L. and Holmes, M.L., "Modeling and Control of a Six Degree of Freedom Magnetic/Fluidic Motion Control Stage," *IEEE Transactions on Control Systems Technology*, *Special Issue on Magnetic Bearing Control,* Vol. 4, No. 5, September 1996, pp. 553-564.**

   2.8. Subrahmanyan, P.K., Olson, S. M., and Trumper, D.L., "Linearizing Control of Magnetic Suspension Systems," *IEEE Transactions on Control Systems Technology*, Vol. 5, No. 4, July 1997, pp. 427-438.**

   2.9. Kim, W-J, Trumper, D.L. and Bryan, J., "Linear Motor Levitated Stage for Photolithography," *CIRP Annals*, Vol. 46/1/1997, pp. 447-450.**

   2.10. Nohavec, D.R., and Trumper, D.L., "Super-Hybrid Magnetic Suspensions for Interferometric Scanners," *JSME International Journal*, Series C, Vol. 40, No. 4, Dec, 1997, pp. 570-583, Special Issue on Magnetic Bearings. **

2.11. Kim, W-J, Trumper, D.L, "High-Precision Magnetic Levitation Stage for Photolithography," *Precision Engineering,* Vol. 22, No. 2, April 1998, pp. 66-77.**

2.12. Kim, W-J, Trumper, D.L, Lang, J.H., "Modeling and Vector Control of a Planar Magnetic Levitator," *IEEE Transactions on Industry Applications,* Vol. 34, No. 6, Nov./Dec., 1998, pp. 1254-1262.**

2.13. Ludwick, S.J., Chargin, D.A., Calzaretta, J.A., and Trumper, D.L., "Design of a Rotary Fast Tool Servo for Ophthalmic Lens Fabrication," *Precision Engineering*, Vol. 23, No. 4, September, 1999.**

2.14. Holmes, M.L., Hocken, R.J., and Trumper, D.L., "The Long-Range Scanning Stage: a Novel Platform for Scanned-Probe Microscopy," *Precision Engineering*; Vol. 24, No. 3, July, 2000.**

2.15. Wang, C-H., Hocken, R.J., and Trumper, D.L., "Dynamics and Control of the UNCC/MIT Subatomic Measuring Machine," *CIRP Annals,* Vol. 50/1/2001, pp. 373-376.

2.16. Lu, X., Weng, M.C., and Trumper, D.L., "Vibration Control of Flexible Structures Using Sensor Averaging and Actuator Averaging Methods," IEEE Transactions on Control Systems Technology, Volume 10, Issue 4, July, 2002.**

2.17. Sato, Y., Trumper, D. L., "A Vibration Isolation Platform," *Mechatronics*, Volume 12, Issue 2, February, 2002.

2.18. Chen, K-S, "Trumper, D.L., and Smith, S.T., Design and Control for an Electromagnetically Driven X-Y-Theta Stage," *Precision Engineering,* Vol. 26, No. 4, October, 2002.**

2.19. Konkola, P., Trumper, D.L., "Electromagnetic Design of a Low-Fringing-Field Magnetic Bearing Stage for Electron Beam Lithography," *JSME International Journal, Special Issue on Magnetic Bearings*, Series C, Vol. 46, No. 2, June 2003.**

2.20. Byl, M.F., Ludwick, S.J., and Trumper, D.L., "A Loop-Shaping Perspective for Tuning Adaptive Feedforward Controllers," *Precision Engineering: Journal of the International Societies for Precision Engineering,* Vol. 29, Issue 1, January, 2005, pp. 27-40.**

2.21. Stein, A.J., Hocken, R.J., and Trumper, D.L., "A Metrological Atomic Force Microscope," accepted for publication with mandatory revisions for *Precision*

Engineering: Journal of the International Societies for Precision Engineering, currently in revision.**

2.22. Lu, X-L, and Trumper, D.L., "Ultrafast Tool Servos for Diamond Turning," *CIRP Annals,* Vol. 54/1/2005, pp. 383-388.**

2.23. Trumper, D.L., "Levitation Linear Motors for Precision Positioning," IEEJ Transactions on Electronics, Information and Systems, No.10, 2006.**

3. Proceedings of Refereed Conferences:

3.1. Trumper, D.L. and Slocum, A.H., "Five Degree of Freedom Control of an Ultra-Precision Magnetically-Suspended Linear Bearing," NASA Workshop on Aerospace Applications of Magnetic Suspension Technology, Sept. 25-27, 1990.

3.2. Trumper, D.L., "Nonlinear Compensation Techniques for Magnetic Suspension Systems," NASA Workshop on Aerospace Applications of Magnetic Suspension Technology, Sept. 25-27, 1990.

3.3. Trumper, D.L. and Queen, M.A., "Precision Magnetic Suspension Linear Bearing," NASA International Symposium on Magnetic Suspension Technology, Aug. 19-23, 1991. **

3.4. Trumper, D.L., Sanders, J.C., Nguyen, T.H., and Queen, M.A., "Experimental Results in Nonlinear Compensation of a One-Degree-of-Freedom Magnetic Suspension," NASA International Symposium on Magnetic Suspension Technology, Aug. 19-23, 1991. **

3.5. Trumper, D.L. and Slocum, A.H., "Nanometer Motion Control via Magnetic Suspension," Proceedings of the 6th Annual Meeting of the American Society for Precision Engineering, Oct. 13-18, 1991.

3.6. Trumper, D.L. and Queen, M.A., "Control and Actuator Design for a Precision Magnetic Suspension Linear Bearing," SPIE OE/Aerospace Sensing Symposium, Conference No. 1696, Controls for Optical Systems, Orlando, FL, April 20-24, 1992. **

3.7. Trumper, D.L., Nguyen, T., and Williams, M., "Power-Efficient Linear Motor for Precision Motion Control," Proceedings of the 7th Annual Meeting of the American Society for Precision Engineering, Oct. 20-23, 1992. **

3.8. Poovey, T., Holmes, M., and Trumper, D.L., "A Kinematically Coupled Magnetic Bearing Test Fixture," Proceedings of the 7th Annual Meeting of the American Society for Precision Engineering, Oct. 20-23, 1992. **

3.9. Trumper, D.L., Williams, M.E., and Nguyen, T.H., "Magnet Arrays for Synchronous Machines," IEEE Industry Applications Society Annual Conference, Toronto, Canada, Oct. 3-8, 1993.

3.10. Trumper, D.L., Williams, M.E., and Nguyen, T., "Magnetic Linear Bearing: Theory and Experiment," 7th International Precision Engineering Seminar (IPES-7), Kobe, Japan, May, 1993. **

3.11. Williams, M.E. and Trumper, D.L., "Materials for Efficient High-Flux Magnetic-Bearing Actuators," Proceedings of the 2nd International Symposium on Magnetic Suspension Technology, Seattle, WA, Aug. 11-13, 1994, NASA Conference Publication #3247, Part 1, pp. 135-145. **

3.12. Kuzin, A.V., Holmes, M.L., Behrozjou, R., and Trumper, D.L., "Analysis of Achievable Disturbance Attenuation in a Precision Magnetically-Suspended Motion Control System," Proceedings of the 2nd International Symposium on Magnetic Suspension Technology, Seattle, WA, Aug. 11-13, 1994, NASA Conference Publication #3247, Part 2, pp. 653-665. **

3.13. Trumper, D.L., Holmes, M., Behrozjou, R., and Batchelder, D., "Magnetic/Fluid-Bearing Stage for Atomic-Scale Motion Control," 1994 ASPE Spring Topical Meeting, Tucson, AZ, April 6-8, 1994. **

3.14. Trumper, D.L., Holmes, M., Behrozjou, R., and Batchelder, D., "Atomic-Scale Motion Control via Hybrid Fluid/Magnetic Bearings," 4th International Symposium on Magnetic Bearings, Zürich, Switzerland, August 25, 1994. **

3.15. Trumper, D.L., Kim, W-J. and Williams, M.E., "Design & Analysis Framework for Linear Permanent Magnet Machines," 1994 IEEE Industry Applications Society Annual Meeting, Denver, CO, October 2-7, 1994. **

3.16. Williams, M.E. and Trumper, D.L., "Precision Magnetic Bearing Six Degree of Freedom Stage," Proceedings of the 9th Annual Meeting of the American Society for Precision Engineering, October 2-7, 1994, pp. 65-68. **

3.17. Chen, K.S., Montero, A., Trumper, D.L., Smith, S.T., and Williams, M.E., "Spring Dominated Design of a High Load Capacity Electromagnetically Driven X-Y-□ Stage," 1995 ASPE Annual Meeting, October, 1995.**

3.18. Ludwick, S.J., Trumper, D.L., and Holmes, M.L., "Design and Control of a Six Degree of Freedom Magnetic/Fluidic Motion Control Stage," ASME 1995 International Mech. Eng. Congress and Exposition, San Francisco, CA, DSC Volume 57-1, pp. 511-518, November 12-17, 1995. **

3.19. Ludwick, S.J., Trumper, D.L., and Holmes, M.L., "Feedback Linearization in a Six Degree-of-Freedom Mag-Lev Stage," Third International Symposium on Magnetic Suspension Technology, Tallahassee, FL, December 13-15, 1995. **

3.20. Williams, M.E. and Trumper, D.L., "Precision Magnetic Bearing Six Degree of Freedom Stage," Third International Symposium on Magnetic Suspension Technology, Tallahassee, FL, Dec. 13-15, 1995. **

3.21. Kim, W.-J. and Trumper, D.L., "Force Ripple in Surface-Wound Permanent-Magnet Linear Motors", IEEE Intermag '96, Seattle, WA, April 9-12, 1996.**

3.22. Schwartz, L.S. and Trumper, D.L., "Magnetic Optical Bearing Design for Minor Wavelength Scans in a Spaceborne Interferometer," 5th International Symposium on Magnetic Bearings, Kanazawa, Japan, August 28-30, 1996.**

3.23. Kim, W.-J., Berhan, M.T., Trumper, D.L., and Lang, J.H., "Analysis and Implementation of a Tubular Motor with Halbach Magnet Array, " 1996 IEEE-IAS Annual Meeting, San Diego, CA, October 5-10, 1996.**

3.24. Ludwick, S. J. and Trumper, D.L., "Noise Optimal Control of a Fluid-Floated Magnetic Positioner," Proceedings of the 1996 ASME Int'l Mechanical Engineering Congress and Exposition, Atlanta, GA, November 1996, DSC-Vol. 58, pp. 309-316.**

3.25. Holmes, M.L., Hocken, R.J., and Trumper, D.L., "A Long-Range Scanning Stage (The LORS Project)," Proceedings of 1996 ASPE Annual Meeting, November 1996.**

3.26. Hocken, R., Holmes, M.L., and Trumper, D.L., "Progress on the Long Range Magnetic Stage," Proceedings of the 9th International Precision Engineering Seminar, Braunschweig, Germany, May 26-30, 1997.**

3.27. Kim, W.-J., Lang, J., and Trumper, D.L., "Modeling and Vector Control of a Planar Magnetic Levitator, " IEEE IAS 32nd Annual Meeting, October 9, 1997.**

3.28. Kim, W-J, and Trumper, D.L., "High-Precision Magnetic Levitation Stage for Photolithography," Proceedings of 1997 ASPE Annual Meeting, Norfolk, VA, Oct. 7-9, 1997.**

3.29. Holmes, M.L., Hocken, R.J., and Trumper, D.L., "A Long-Range Scanning Stage (The LORS Project)," Proceedings of 1997 ASPE Annual Meeting, October 7-9, 1997, Norfolk, VA.**

3.30. Williams, M.E., Subrahmanyan, P.K., and Trumper, D.L., "Six Axis Active Vibration Isolation and Payload Reaction Force Compensation System," Proceedings of 1997 ASPE Annual Meeting, October 7-9, 1997, Norfolk, VA.**

3.31. Kim, W-J, and Trumper, D.L., "Six-Degree-of-Freedom Planar Positioner with Linear Magnetic Bearings/Motors," 6th International Symposium on Magnetic Bearings, MIT, Cambridge, MA, Aug. 5-7, 1998.**

3.32. Holmes, M. L., Trumper, D.L., Hocken, RJ., "Magnetically-Suspended Stage for Accurate Positioning of Large Samples in Scanned Probe Microscopy," 6th International Symposium on Magnetic Bearings, MIT, Cambridge, MA, Aug. 5-7, 1998.**

3.33. Subrahmanyan, P.K., Williams, M.E., and Trumper, D.L., "Active Vibration Isolation Design for a Photolithographic Stepper," 6th International Symposium on Magnetic Bearings, MIT, Cambridge, MA, Aug. 5-7, 1998.**

3.34. Gibbons, K.A., Borenstein, J.T., Nokes, D.S., Weinberg, M.S., and Trumper, D.L., "The Design, Fabrication, and Testing of a Micromechanical Silicon Oscillating Accelerometer," AIAA Conference on Guidance and Control, Boston, MA, August 10-12, 1998.**

3.35. Ludwick, S.J., Ma, D.C., and Trumper, D.L., "A Rotary Arm Based Turning Machine for Ophthalmic Lenses," proceedings of the 1998 ASPE Annual Meeting, October 25-30, 1998, St. Louis, MO.**

3.36. Liebman, M.J., and Trumper, D.L., "Pushing the Thermal Limit in Linear Motors," proceedings of the 1998 ASPE Annual Meeting, October 25-30, 1998, St. Louis, MO.**

3.37. Subrahmanyan, P.K., and Trumper, D.L., "Eigenstructure Assignment Techniques for Precision Motion Control," proceedings of the 1998 ASPE Annual Meeting, October 25-30, 1998, St. Louis, MO.**

3.38. Kim, W-J, and Trumper, D.L., "Precision Control of Planar Magnetic Levitator," proceedings of the 1998 ASPE Annual Meeting, October 25-30, 1998, St. Louis, MO.**

3.39. Kim, W-J, and Trumper, D.L., "Velocity Regulation Limits in a Precision Two-Dimensional Magnetic Levitator," IEEE 1999 International Magnetics Conference (INTERMAG 99), May 18-21, 1999, Kyongju, Korea.**

3.40. Subrahmanyan, P.K, and Trumper, D.L., "Eigenvector Assignment", received best presentation award in session TM-10, 1999 American Control Conference, June 2-4, 1999, San Diego, CA.**

3.41. Weng, M-C., Ritter, R.J., and Trumper, D.L., "Magnetic Suspension and Vibration Control of Beams for Non-Contact Processing," 1999 IEEE Conference on Control Applications, Kohala Coast-Island of Hawaii, USA, August 22-26, 1999.**

3.42. Trumper, D.L., and Ludwick, S.J., "Development of 2.737 Mechatronics at MIT," *invited paper* for special session on Teaching Mechatronics, proceedings of IEEE/ASME Conference on Advanced Intelligent Mechatronics (AIM `99), Atlanta, GA, September 19-23, 1999, pp. 446-451.

3.43. Ludwick, S.J., Chargin, D.A., Calzaretta, J.A., and Trumper, D.L., "Calibration and Control of a Rotary Fast Tool Servo," 1999 ASPE Annual Meeting, Monterey, CA, Oct. 31-Nov. 4, 1999.**

3.44. Weng, M.C., and Trumper, D.L., "A Design Method for Magnetic Suspension and Vibration Control of Levitated Beams for Noncontact Processing," Proceedings of the 5th International Symposium on Magnetic Suspension Technology, December 1-3, 1999.**

3.45. Trumper, D.L., and Ludwick, S.J., "Development of dSPACE Tools for 2.737 Mechatronics at MIT," dSPACE User's Conference, Detroit, MI, May 1-2, 2000.**

3.46. Trumper, D.L., and Sato, T., "A Vibration Isolation Platform," Mechatronics 2000, the 7th Mechatronics Forum International Conference, Atlanta, GA, Sept. 6-8, 2000.

3.47. Calzaretta, J., Ludwick, S.J., and Trumper, D.L., "Repetitive Control of a Fast-Tool Servo for Asymmetric Diamond Turning," Mechatronics 2000, the 7th Mechatronics Forum International Conference, Atlanta, GA, Sept. 6-8, 2000.**

3.48. Trumper D.L., Weng, M-C, and Lu, X., "Magnetic Suspension of Flexible Elements," 7th International Symposium on Magnetic Bearings, Zurich, Switzerland, Aug., 2000.**

3.49. Calzaretta, J., Ludwick, S., Byl, M., Trumper, D., "Repetitive Control of a Rotary Fast Tool Servo," ASPE Spring Topical Meeting on Control of Precision Systems, Sheraton Rittenhouse Hotel, Philadelphia, PA, April 18-20, 2001.**

3.50. Sato, Y., Trumper, D.L., "A Novel Single Degree-Of-Freedom Active Vibration Isolation System," 2001 Annual Meeting of the ASPE, Crystal City, VA, Nov 13-16, 2001.

3.51. Liebman, M., Trumper, D.L., "Rotary-Linear Hybrid Axes for Meso-Scale Machining," 2001 Annual Meeting of the ASPE, Crystal City, VA, Nov 13-16, 2001.

3.52. Byl, M.F., Calzaretta, J.A., Ludwick, S.J., and Trumper, D.L., "Tuning Controllers with Multiple Adaptive Feed-Forward Cancellation Resonators," 2002 Annual Meeting of the EUSPEN, University of Eindhoven, May 26-30, 2002.

3.53. Konkola, P., and Trumper, D.L., "Magnetic Bearing Stages for Electron Beam Lithography," Eighth International Symposium on Magnetic Bearings (ISMB-8), Hotel Lake View Mito, Japan, August 26-28, 2002.

3.54. Sato, T., and Trumper, D.L., "A Novel Single Degree-of-Freedom Active Vibration Isolation System," Eighth International Symposium on Magnetic Bearings (ISMB-8), Hotel Lake View Mito, Japan, August 26-28, 2002. (this work is an extension/revision of paper #50 above, with some portions in common)

3.55. Shilpiekandula, V., Trumper, D. L. , Liebman, M. K., and Vona, M. A, "A Laser Speckle Sensor for Compound Rotary-linear Motion Metrology, 2003 Annual Meeting of the ASPE, Portland, OR, October, 25-30, 2003.**

3.56. Trumper, D.L., and Lu, X-D, "Electromagnetically-Driven Ultrafast Tool Servo," 2003 Annual Meeting of the ASPE, Portland, OR, October, 25-30, 2003.**

3.57. Montesanti, R. C., and Trumper, D.L., "High-Bandwidth Short-Stroke Rotary Fast Tool Servo," 2003 Annual Meeting of the ASPE, Portland, OR, October, 25-30, 2003.**

3.58. Cattell, J.H., and Trumper, D.L., "Adaptive Feedforward Cancellation Viewed from an Oscillator Amplitude Control Perspective," 2003 Annual Meeting of the ASPE, Portland, OR, October, 25-30, 2003.**

Record of Research Funding for
David L. Trumper

3.59. Montesanti, R. C., and Trumper, D.L., "A 10 kHz Short-Stroke Rotary Fast Tool Servo," 2004 Annual Meeting of the ASPE, Orlando, FL, October, 23-28, 2004.**

3.60. Lu, X-L., and Trumper, D.L., "Electromagnetically-Driven Ultrafast Tool Servo," 2004 Annual Meeting of the ASPE, Orlando, FL, October, 23-28, 2004.**

3.61. Yang, H.; Buice, E. S.; Peruru, H; Smith, S. T.; Hocken, R. J. (University of North Carolina-Charlotte); Smith, R. M. (National Institute of Standards and Technolology); and Trumper, D. L.; Otten, D. (Massachusetts Institute of Technology), "Multi-degree-of-freedom Ultra-precision Motion Control Platform for Measurement of Nano-structures: A Coarse/fine Approach," 2004 Annual Meeting of the ASPE, Orlando, FL, October, 23-28, 2004.**

3.62. Lu, X-L., and Trumper, D.L., "An Ultra-Fast Tool Servo for Diamond Turning of Contoured Surfaces," 2005 Annual Meeting of the ASPE, Norfolk, VA, October, 10-14, 2005.**

3.63. Byl, M.F., and Trumper, D.L., "A Long Stroke Fast Tool Servo with Integral Balance Mass," 2005 Annual Meeting of the ASPE, Norfolk, VA, October, 10-14, 2005.**

3.64. Mazzeo, A., Trumper, D.L., Stein, A.J., and Hocken, R.J., "Atomic Force Microscope for Accurate Dimensional Metrology," 2005 Annual Meeting of the ASPE, Norfolk, VA, October, 10-14, 2005.**

3.65. Montesanti, R.C., and Trumper, D.L., "System Dynamics and Control System for a High Bandwidth Rotary Actuator and Fast Tool Servo," 2005 Annual Meeting of the ASPE, Norfolk, VA, October, 10-14, 2005.**

3.66. Barton, A., and Trumper, D.L., "Rubber Bearings and Their Applicability in Precision Machines," 2005 Annual Meeting of the ASPE, Norfolk, VA, October, 10-14, 2005.**

3.67. Buice, E. S., Yang, H., Smith, S. T., Hocken, R. J., Trumper, D. L., Otten, D., and Seugling, R., "Early Testing of a Coarse/Fine Precision Motion Control System," 2005 Annual Meeting of the ASPE, Norfolk, VA, October, 10-14, 2005.**

3.68. Trumper, D.L., "Low Stray Field Maglev Stages for Vacuum Applications," ASPE Spring Topical Meeting, Pittsburgh, PA, May 1-2, 2006.**

3.69. Trumper, D.L., and Lu, X-D., "Fast Tool Servos: Advances in Precision, Acceleration, and Bandwidth," 11th International Conference on Precision Engineering, Tokyo, Japan, August, 2006.**

4. Other Major Publications

4.1. Trumper, D.L. and Roberge, J.K., problem-solution manual for MIT video course, "Electronic Feedback Systems," MIT's Center for Advanced Engineering Study, 1986.

4.2. Course notes for 6.302/16.30 on classical control system design; joint with J. Roberge, L. Gould, W. Markey. Notes also used in Course 2.737. Notes used from 1993 to present.

4.3. Proceedings of the Sixth International Symposium on Magnetic Bearings (D. Trumper, P. Allaire, eds.), MIT, Cambridge, MA, August 1998.

4.4. Course notes for 2.003 Modeling, Dynamics, and Control I. Notes in development as a textbook.

4.5. Lundberg, K.H., Miller, H.R., and Trumper, D.L., "Troubles at the Origin: Consistent Usage and Properties of the Unilateral Laplace Transform," submitted to IEEE Control Systems Magazine, August, 2004.

5. Internal Memoranda and Progress Reports:

None.

6. Invited Lectures:
March 1992, "Analysis and Design of a Novel Magnetic Suspension Linear Motor," MIT Laboratory of Electromagnetic and Electronic Systems, Cambridge, MA; also at Lincoln Laboratory, Lexington, MA.

November 1992, "Electromagnetic Bearings and Drives for Nanometer-Scale Motion Control," Carnegie Mellon University, Pittsburgh, PA, also at Stanford University, Palo Alto, CA.

January 1993, "Precision Control System Design," Polaroid Corp., Cambridge, MA, also at MIT Leaders for Manufacturing, Cambridge, MA (half-day seminar at Polaroid, full-day seminar for LFM).

Record of Research Funding for
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August 1993, "Magnetic Suspension Lithography Stage Design", University of Tokyo, Tokyo, Japan; also at Ibaraki University, Hitachi City, Japan; also at Ritsumeikan University, Kyoto, Japan.

August 1994, "Magnetic Linear Bearing: Theory and Experiment," Physikalisch-Technische Bundesanstalt, Braunschweig, Germany.

August 1994, "Atomic-Scale Motion Control via Hybrid Fluid/Magnetic Bearings," Physikalisch-Technische Bundesanstalt, Braunschweig, Germany.

October 1994, "Design of Fluidic/Magnetic Suspension Systems for Atomic-Scale Positioning," MIT Mechanical Engineering Colloquium, Cambridge, MA.

February 1995, "Magnetic Suspension Systems for Atomic-Scale Positioning," seminar for IEEE Control Systems Society, Boston, MA.

April 1995, "Precision Mechatronic Systems", Allen-Bradley, Milwaukee, WI.

August 1996, "Atomic-Resolution Magnetic Suspension Design", University of Tokyo, Tokyo, Japan.

October 1996, "Magnetic Bearing Stages for Lithography and Scanned Probe Microscopy," Draper Laboratory, Cambridge, MA.

November 1996, "Possibilities for Maglev Positioners for E-Beam Lithography," ETEC Corporation, Hayward, CA.

November 1996, "The Application of Magnetic Suspension Technology to Precise Positioning Systems," Sandia National Labs, Livermore, CA; also at Lawrence Livermore National Labs, Livermore, CA.

November 1996, "The Development of Precision Magnetically-Suspended Stages for Lithographic Systems", Departmental Colloquium, Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY.

April 1997, "Design and Control of Precision Magnetic Suspension Stages," George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA.

April 1997, "Mechatronic System Design Elements," a three-hour tutorial, George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA.

Record of Research Funding for
David L. Trumper

October 1997, "An Overview of Magnetic Suspension Stage Design," 1997 ASPE Annual Conference, Norfolk, VA, *invited presentation*.

April 1998, "Magnetically-Levitated Positioning Systems With Sub-Nanometer Resolution," Mechanical Engineering Department, University of Wisconsin-Madison, Madison,WI

October, 1998, "Mechatronics: A Focus for Research and Teaching in Mechanical Engineering," MIT Mechanical Engineering Colloquium, Cambridge, MA.

October, 1998, "Precision Mechatronic Systems," Mechanical Engineering Dept. Seminar Series, Univ. of Illinois, Urbana-Champaign, IL.

February, 1999, "Precision Mechatronic Systems," Mechatronics Seminar, Mechanical Engineering Dept., Clemson University, Clemson, SC.

April, 1999, "Magnetic Bearing Positioning Systems for Semiconductor Manufacturing," *invited presentation* at the National Academy of Engineering 2nd German - American Frontiers of Engineering Symposium, Irvine, CA.

April, 1999, "Precision Mechatronic Systems," Jones Seminar, Thayer School of Engineering, Dartmouth College, Hanover, NH.

April, 1999, "Precision Magnetic Suspensions for Manufacturing," Dept. of Aerospace and Mechanical Engineering, Cornell University, Ithaca, NY.

September, 1999, "Development of 2.737 Mechatronics at MIT," *invited paper* for special session on Teaching Mechatronics, IEEE/ASME Conference on Advanced Intelligent Mechatronics (AIM `99), Atlanta, GA.

November, 1999, "Fast Tool Servo for Diamond Turning of Asymmetric Optics," Mechanical Engineering Dept., University of Rhode Island.

January, 2000, "A New Rotary Fast Tool Servo for Diamond Turning of Asymmetric Optics," Mechatronics Seminar, Institute of Robotics, Swiss Federal Institute of Technology, Zurich, Switzerland.

March 2000, "Precision Mechatronic Systems," Mechanical Engineering Departmental Seminar, University of Minnesota, Minneapolis, MN

August 2000, "Precision Motion Control Research at MIT," Mechanical Engineering Dept., Swiss Federal Institute of Technology, Lausanne, Switzerland.

Record of Research Funding for
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March, 2001, "Mechatronics at MIT," Inaugural Symposium for the Professorship of Jan van Eijk, Delft University, Delft, Netherlands.

May, 2002, "Magnetic Bearings with Atomic-Scale Precision," invited presentation, Precision Engineering Group, Physikalisch-Technische Bundesanstalt (German National Standards Laboratory), Braunschweig, Germany.

June, 2002, "Projects for Teaching Mechatronics at MIT," invited Plenary Session Paper, Mechatronics 2002, University of Twente, Enschede, Netherlands.

August, 2002, "Combined Force/Position and Moment/Slope Control of Levitated Continua," invited paper at the 8th International Symposium on Magnetic Bearings, Mito, Japan.

March, 2004, "Viewpoints on Teaching Modelling, Dynamics, and Control at MIT," RPI, Troy, NY.

May, 2004, "From Wafer Steppers to Flying Broomsticks," Departmental Seminar, University of Massachusetts, Amherst, MA.

December, 2004, "Precision Mechatronics Research at MIT," Departmental Seminar, Mechanical Engineering Department, Columbia University, New York, NY.

January, 2005, "Ultrafast Tool Servos: Electromagnetics and Control," Departmental Seminar, Mechanical Engineering Department, University of British Columbia, Vancouver, BC, Canada.

October, 2005, "Levitation Linear Motors," invited Keynote Paper, Linear Drives for Industry Applications Conference, Awaji Island, Japan.

August, 2006, "Fast Tool Servos: Advances in Precision, Acceleration, and Bandwidth," invited Keynote Paper, International Conference on Precision Engineering, Tokyo, Japan.

Theses supervised by David L. Trumper

Summary

	Total	Completed	In Progress
Bachelor's	25	25*	0
Master's	44	39	5
Engineer's	–	–	–
Doctoral			
As Supervisor	11	10	1
As Reader	14	13	1

[* 6 students used Master's Theses to satisfy S.B. requirements.]

Bachelor's Theses: (also see Master's theses)

Aggarwal, Sanjay, "High-Bandwidth Magnetic Bearing System," June 1995.

Sheppard, Dean, "Lightweight Structures for Magnetic Suspension," December 1995.

Rohatgi, Gaurav, "Implementation of Digital Control Techniques with Application to a Flexible Manipulator," February 1996.

Ma, David, "Modelling and Control of a Three Degree of Freedom Flexural Stage", June 1996.

Irigoyen, Esteban, "Servo Motor Test Bed," June 1996.

Workeneh, Yedilakil, "Vibration Isolation Platform Design and Control," June, 1998.

St. Michel, Nathan, "Computer-Modeling of a Force-Magnifying Beam Structure," June, 1998.

Stevens, Duane, "Independent Study in Control Systems Design," January, 1999.

Lillienkamp, Katie, "Dynamic Signal Analyzer Implemented on dSPACE System", January, 1999.

Perry, Michael, "Electronics Design for Magnetic Suspension of a Flexible Beam," June, 1999.

Theses supervised by David L. Trumper

Stimac, Andrew, "Controller for Inverted Pendulum Classroom Demonstration," June, 1999.

Hollerman, Peggy, "Weightlessness Demo for 8.01," June, 2000.

Wang, Evelyn, "Momentum Demo for 8.01," June, 2000.

Salzman, Rhonda, "Satellite Capture Device," Feb., 2000.

Wu, Ming, "Instrumentation for Los Alamos Physics Group," Feb. 2000.

Hawe, Larry, "Medical Device Weaving Machine,", June, 2004.

Rosales, Evencio, "Ball-on-Beam Balancer,", June, 2004.

Chou, Danielle, "Friction Modeling Techniques," June, 2004.

Baranowski, Robert, "Magnetic Suspension Sensor," June, 2006.

Master's Theses:

Poovey, Tony, "A Kinematically-Coupled Magnetic Bearing Test Fixture," UNC-Charlotte, Mechanical Engineering and Engineering Science, December 1992.

McMahill, Daniel R., "A High Dynamic Range Capacitive Displacement Sensor," MIT, Electrical Engineering and Computer Science, June 1993.

Batchelder, David, "Analysis and Design of High-Resolution Capacitance Probes For Use in a Precision Motion Control Stage," UNC-Charlotte, Electrical Engineering, May 1994.

Heine, Travis, "The Development of a Three-Degree of Freedom Vibration Control Test Facility," MIT, Mechanical Engineering, May 1994 (also used for B.S. degree).

Holmes, Michael, "Analysis and Design of a Magnetically-Suspended Precision Motion Control Stage", UNC-Charlotte, Electrical Engineering, May 1994.

Olson, Sean, "Nonlinear Compensation of a Single Degree of Freedom Magnetic Suspension System," MIT, Mechanical Engineering, May 1994 (also used for B.S. degree).

Nguyen, Tiep H., "Automatic Controls for a Precision Magnetic Suspension Linear Motor," UNC-Charlotte, Electrical Engineering, February 1995.

Theses supervised by David L. Trumper

Chen, Kuo-Shen, "A Spring-Dominated Regime Design of a High Load Capacity, Electromagnetically Driven X-Y-□ Stage," MIT, Mechanical Engineering, May 1995.

Schwartz, Lawrence, "Magnetic Optical Bearing (MOB) Design for Mirror Wavelength Scans in a Spaceborne Interferometer," MIT, Mechanical Engineering, May 1995 (also used for B.S. degree).

Behrouzjou, Roxana, "Analysis and Control of a Magnetically Suspended Scanning Tunneling Microscope," UNC-Charlotte, Electrical Engineering, June 1995.

Ludwick, Stephen, "Modeling and Control of a Six Degree of Freedom Magnetic/Fluidic Motion Control Stage," MIT, Mechanical Engineering, February 1996.

Berhan, Michael, "Implementation of a Halbach Array in a Tubular Linear Motor," MIT, Mechanical Engineering, May 1996.

Gibbons, Kevin, "A Micromechanical Silicon Oscillating Accelerometer," MIT, Mechanical Engineering, February 1997.

Nohavec, Donald, "Magnetic Bearing Designs for Interferometric Mirror-Scanning Mechanisms," MIT, Mechanical Engineering Dept., June 1997.

Bibler, Jared, "Effects of Imbalance and Geometric Error on Precision Grinding Machines," MIT, Mechanical Engineering, June 1997 (also used for B.S. degree).

Hoctor, John, "The Measurement of Automotive Wheel Loads at the Bearing Cup," MIT, Mechanical Engineering, February, 1998 (also used for B.S. degree).

Konkola, Paul, "Magnetic Bearing Stages for Electron-Beam Lithography," MIT, Mechanical Engineering, February, 1998.

Liebman, Michael, "Thermally Efficient Linear Motor Analysis and Design," MIT, Mechanical Engineering, February, 1998.

Ma, David, "Novel Lens Cutting Machine," MIT, Mechanical Engineering , June, 1998.

Garcia, Fermin, "Spacecraft Attitude Control System," MIT, Mechanical Engineering, June 1998.

Salvatore, Claudio, "Linear and Nonlinear Compensation Techniques for Control of a Single Degree of Freedom Magnetic Bearing," MIT, Mechanical Engineering, June 1998.

Theses supervised by David L. Trumper

Trapp, Thomas, "Modeling and Control of a Fish-Like Vehicle," MIT, Mechanical Engineering, June 1998.

Wong, Sai Bun, "Integrated-Circuit Capacitive Displacement Gages," MIT, Electrical Engineering Dept., June, 1998.

Ritter, Robin, "Sensor Designs for Magnetic Suspension Material Processing Systems," MIT, Mechanical Engineering, February, 1999.

Chargin, David, "Rotational Servomechanisms for Precision Turning Machines," MIT, Mechanical Engineering, June, 1999.

Cunningham, Rachel, "Thermal System Design for the PHENIX Experiment," MIT, Mechanical Engineering, June 1999 (also used for B.S. degree).

St. Michael, Nathan, "Design and Fabrication of Silicon Oscillating Accelerometers," MIT, Mechanical Engineering, June, 2000.

Vona, Marty, "Metrology Techniques for Compound Rotary Linear Motion," MIT, Computer Science, June, 2001.

Kendale, Amar, "Novel Stamp Generation and Printing Techniques for Soft Contact Lithography," February, 2002.

Garcia, Christian, MIT, Mechanical Engineering, "Magnetic Levitation for Down-Hole Submersible Pumps," June 2002.

Stein, Andrew, "A Metrological Atomic-Force Microscope," MIT, Mechanical Engineering, September, 2002.

Lilienkamp, Katie, "A Modular System for Lab-Based Teaching in Modeling, Dynamics, and Control," February, 2003.

Cattell, Joseph, "Adaptive Feedforward Cancellation Viewed from an Oscillator Amplitude Control Perspective," MIT, Mechanical Engineering, June 2003.

Yi, Xie, "Magnetic Suspension Demonstration System,", MIT, Electrical Engineering, June, 2003.

Shilpiekandula, Vijay, "Speckle-Based Rotary-Linear Sensor," MIT, Mechanical Engineering, February, 2004.

Barton, Augusto, "Rubber Bearings for Precision Positioning Systems", MIT, Mechanical Engineering, September, 2005.

Theses supervised by David L. Trumper

Mazzeo, Aaron, "Accurate Capacitance Metrology for Atomic Force Microscopy," MIT, Mechanical Engineering, September, 2005.
Hawe, Larry, "Control of a Fast Steering Mirror for Laser-Based Communication," January, 2006.

Cuff, David, "Magnetic Nanopositioners," June, 2006.

Kluk, Dan, "Electromagnetic Fast Steering Mirror," work started September, 2005.

Albert, Kevin, "Flexible Robotics," work started September, 2005.

Miu, Kevin, "Advanced Active Vibration Isolation," work started June, 2006.

Ljubicic, Dean, "Accurate, Fast Atomic Force Microscope," work started June, 2006.

Boulet, Michael, work started June, 2006.

Doctoral Theses, Supervisor:

Kim, Won-Jong, "High-Precision Planar Magnetic Levitation," MIT, Electrical Engineering and Computer Science, June 1997.

Williams, Mark E., "Precision Six Degree of Freedom Magnetically-Levitated Photolithography Stage," MIT, Mechanical Engineering, February, 1998.

Holmes, Michael, "Long-Range Scanning Stage," UNC-Charlotte, Electrical Engineering, June 1998.

Ludwick, Stephen, "High-Speed Lens Cutting Machine", MIT, Mechanical Engineering, June, 1999.

Subrahmanyan, Pradeep, "Magnetic Suspension Vibration Isolation Systems," MIT, Mechanical Engineering, September, 1999.

Weng, Ming-Chih, "Tube Suspension", MIT, Mechanical Engineering, February, 2000.

Liebman, Michael, "Rotary-Linear Axes for High Speed Machining," MIT, Mechanical Engineering, September, 2001.

Byl, Marten, "High-Accuracy Fast Tool Servo for Asymmetric Turning," MIT, Mechanical Engineering, June, 2005.

Theses supervised by David L. Trumper

Lu, Xiaodong, "Ultra-Fast Tool Servos for Nano-Surfaces," MIT, Mechanical Engineering, September, 2005.

Montesanti, Rick, "Fast Tool Servos for High Spatial Frequency Part Generation," MIT, Mechanical Engineering, September, 2005.

MacKenzie, Ian, "Magnetic Suspension Positioners," work started June, 2006.

Doctoral Theses, Reader:

van Doren, Matthew, "Precision Machine Design Methodology for the Semiconductor Industry", MIT, Mechanical Engineering, June 1995.

Yeh, T.J., "Dynamics and Control of High Precision Magnetic Bearing Systems," MIT, Mechanical Engineering, June 1996.

Ofori, John, "Direct-Drive Motor for Electric Vehicle Propulsion," MIT, Electrical Engineering and Computer Science, September 1996.

Nayfeh, Samir, "Design and Application of Damped Machine Elements," MIT, Mechanical Engineering, June 1998.

Valjavec, Marko, "Die Forming Control", MIT, Mechanical Engineering, February, 1999.

Robinson, David, "Design and Analysis of Series Elasticity in Closed-loop Actuator Force Control," June 2000.

Ottensmeyer, Mark, "A Surgical Haptic Device", February, 2001.

Roberts, David, "Micro-Hydraulic Transducer Systems," February, 2002.

Konkola, Paul, "Interference Lithography," June, 2003.

Kwangduk Douglas Lee, "Load Monitoring of Electrical Systems," June, 2003.

Steve Buerger, "Force Reflecting Actuators," June, 2005.

Kripa Varanasi, "Low Wave Speed Damping of Structures," June, 2005.

Lei Zuo, "Vibration Dynamics and Control," June, 2005.

Theses supervised by David L. Trumper

Golda, Dariuz, expected completion December, 2006.

APPENDIX B

WEST BEND®
HOUSEWARES

6-Quart Electronic Crockery™ Cooker
Instruction Manual

Register this and other West Bend® Housewares products through our website:
www.westbend.com

SAVE THIS INSTRUCTION MANUAL FOR FUTURE REFERENCE

Important Safeguards

⚠ CAUTION

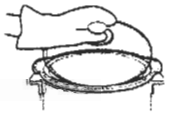
To prevent personal injury or property damage, read and follow all instructions and warnings.

When using electrical appliances, basic safety precautions should always be followed including the following:

- Read all instructions, including these important safeguards and the care and use instructions in this manual.
- Do not use appliance for other than intended use.
- The use of accessory attachments not recommended by West Bend® Housewares may cause injuries.
- Do not use ceramic pot or glass cover if chipped, cracked or has deep scratches as weakened glass and ceramic can shatter during use. Discard immediately. See Replacement Part section in this booklet on how to obtain a replacement part.
- Do not attempt to repair this appliance yourself.
- **For household use only.**

⚠ CAUTION

To prevent burns, personal injury or property damage, read and follow all instructions and warnings.



Heat Precautions

- Do not touch hot surfaces. Use hot pads or oven mitts if you lift or carry the ceramic pot or cover when it is hot.
- Do not move an appliance containing hot oil or other hot liquids.
- Lift cover slowly, directing steam away from you.
- Set ceramic pot and cover on hot pad, trivet or other heat protective surface. Do not set hot ceramic pot or cover directly on the counter, table or other surface.
- Do not preheat the heating base.
- Do not add frozen/cold foods or liquids into heated ceramic pot. Sudden temperature change may cause the cover or ceramic pot to crack or shatter.
- Do not use the ceramic pot or cover on the stove top, under the broiler, in the freezer, or in the oven. You may use the ceramic pot in the microwave oven, but do not place the glass cover in the microwave oven as it has a metal ring.

CAUTION

To prevent electrical shock, personal injury or property damage, read and follow all instructions and warnings.

Electricity Precautions

- To protect against electric shock do not immerse cord, plugs, or other electric parts in water or other liquids.
- Do not operate any appliance with a damaged cord or plug.
- Do not operate when the appliance is not working properly or when it has been damaged in any manner. For service information see warranty page.
- Do not use electric parts outdoors, or place them on or near a gas or electric burner, in a heated oven, or in the refrigerator.
- Always turn control to OFF and unplug the appliance from outlet when not in use and before cleaning.
- Your crockery cooker has a short cord as a safety precaution to avoid pulling, tripping or entanglement. To avoid pulling, tripping or entanglement, position the cord so that it does not hang over the edge of the counter, table or other flat surface areas or touch hot surfaces.
- While use of an extension cord is not recommended, if you must use one, make sure the cord has the same or higher wattage as the crockery cooker (wattage is stamped on the underside of the crockery cooker base). To avoid pulling, tripping or entanglement, position the cord so that it does not hang over the edge of the counter, table or other flat surface areas or touch hot surfaces.
- Use an electrical outlet that accommodates the polarized plug on the crockery cooker. On a polarized plug, one blade of the plug is wider than the other. If the plug does not fit fully into the outlet or extension cord, reverse the plug. If the plug still does not fit fully, contact a qualified electrician. Do not alter the plug.
- Do not use an outlet or extension cord if the plug fits loosely or if the outlet or extension cord feels hot.

⚠ CAUTION

To prevent burns or other personal injuries to children, read and follow all instructions and warnings.

Precautions For Use Around Children

- Always supervise children.
- Do not allow children to operate or be near the crockery cooker, as the outside surfaces are hot during use.
- Do not allow cord to hang over any edge where a child can reach it. Arrange cord to avoid pulling, tripping or entanglement.

SAVE THESE INSTRUCTIONS

Using Your Crockery Cooker – Everyday Use

- Before using for the first time, wash the ceramic pot and cover with hot soapy water, rinse and dry.

1. Place heating base on dry, level, heat-resistant surface, away from any edge.
2. Place foods into ceramic pot, cover and place into heating base. If you need to brown or precook foods – you must use a separate skillet or pan. Direct heat from the stovetop or oven will break the ceramic pot. Plug cord into a 120 volt AC electric outlet only.
3. Press ⏻ On/Off button. **SEL** will be displayed and **HI** temperature setting is indicated with a flashing green light.
4. Press TEMP to select HI, LO, or WARM setting.
5. To turn cooker on press COOK. Display will count up, showing elapsed cooking time.

To program cooking time:

1. Press TEMP. **Note:** Only HI or LO settings are available for programmed cooking time.
2. Press 🕘 (time) button to scroll up to desired cooking time.
3. Press COOK to start cooking cycle. When the cycle is completed the crockery cooker will shift to the WARM setting and timer will count up from zero showing the elapsed time on warm.
4. Press ⏻ On/Off button to turn off your crockery cooker.

Cleaning Your Crockery Cooker

1. Allow the entire unit (base, ceramic pot and cover) to cool before cleaning. Set ceramic pot and cover on dry, heat-protective surface for gradual cooling.
2. Wipe heating base and cord with a damp cloth after it has been unplugged and the base is cool.
3. Ceramic pot and cover may be washed using hot soapy water by hand or cleaned in the dishwasher. Avoid contact between pieces to prevent damage.

- Do not run cold water over hot ceramic pot or cover, as they may crack if cooled suddenly.
- Do not immerse heating base, cord, plugs or other electric parts in water or other iquid.
- Use a non-abrasive cleanser or baking soda paste to remove stains. Do not use metal scouring pads or cleansers. Wipe with distilled vinegar to remove water spots or mineral deposits. Rewash with hot soapy water, rinse and dry.

Helpful Hints

- To extend or change cooking cycle time, press time button and scroll to new cycle time. Press Cook to initiate cycle.
- To change temperature setting, press the TEMP button at any time. Changing temp to WARM will automatically shift timer to show elapsed time. Programmable cooking is not available with WARM setting.
- The Cook button confirms your suggested settings and turns on the crockery cooker. If you fail to press the cook button, the display will beep and flash to alert you. After approximately 10 seconds, the crockery cooker will start in the displayed mode.
- The crockery cooker will automatically shut off after 20 hours of total cooking time. To disable this feature, press the cook and timer buttons simultaneously. You will now be able to cook more than 20 hours, and the display will continue to flash -:--. Press On/Off button to turn off the cooker.
- Some smoke and/or odor may occur upon heating due to the release of manufacturing oils – this is normal.
- Some expansion/contraction sounds may occur during heating and cooling – this is normal
- If your crockery cooker has a Warm function, do **NOT** cook foods on this setting as the temperature does not get hot enough to cook foods. Use Warm setting only to keep hot, cooked foods warm for serving.
- Avoid removing the cover when cooking. Cooking time will be increased due to loss of heat. Remove cover only when necessary to stir or add ingredients. Always lift cover slowly, directing steam away from you.
- After food is cooked, set to lowest setting for serving or turn control to OFF position.
- Unplug cord from electric outlet after use and allow the crockery cooker to cool before cleaning.

- Do not allow children to use the crockery cooker or be around the crockery cooker, as the outside surfaces of the crockery cooker are hot during use.
- Use only plastic, rubber, wooden or non-metal cooking tools with ceramic pot. Use of metal cooking tools may scratch the ceramic pot.
- Stir foods occasionally to reduce sticking to sides of ceramic pot.
- Foods will be brought to a simmer at all cooking settings. The setting determines the time needed to reach a simmer.
- If the ceramic pot is filled less then half full, suggested cooking times should be reduced.
- Less tender, less expensive cuts of meat are better suited to slow cooking then expensive cuts of meat. Remove excess fat from meat when possible before cooking. Remove skin from poultry, if desired, before cooking.
- Raw vegetables take longer to cook than meats as the liquid simmers rather than boils. Cut vegetables into uniform, bite-size pieces to cook evenly.
- You may fill the ceramic pot with food the night before cooking and refrigerate. When ready, place ceramic pot into the heating base and cook. The gradual warming will not harm the ceramic pot.
- Insert a meat thermometer into roast, hams or whole chickens to ensure meats are cooked to recommended temperature. Fresh or thawed fish and seafood fall apart during long hours of cooking. Add these ingredients an hour before serving.
- Milk, sour cream and natural cheese break down during long hours of cooking. Add these ingredients just before serving or substitute with undiluted condensed creamed canned soups or evaporated milk. Processed cheese tends to give better results than naturally aged cheese.
- Rice and pasta may be added uncooked during the last hour of cooking time. If added uncooked, make sure there are at least two cups of liquid in the cooking pot. Stir occasionally to prevent sticking.

Recipes

Many of your favorite recipes may be adapted to the West Bend® Housewares Crockery Cooker. To do so, use the following guide.

If your recipe says to cook for...	Cook at LO for...	Cook at HI for...
30 minutes	6 to 8 hours	3 to 4 hours
35 to 60 minutes	8 to 10 hours	5 to 6 hours
1 to 3 hours	10 to 12 hours	7 to 8 hours

Try some of our favorite recipes using the West Bend® Housewares, LLC Crockery Cooker that we have included on the following pages to get you started.

Chicken Vegetable Stew	
2-2 1/2 lbs	chicken parts - skinned if desired
5	carrots – cut into 1/2-inch pieces
3	ribs celery – cut into 1/2-inch pieces
1	7 ounce can mushroom stems and pieces – undrained
1	15 ounce jar whole small onions – undrained – **OR** 1 medium onion, chopped
1	16 ounce bag frozen peas – rinsed with hot water
1 tsp	salt
3/4 tsp	dried thyme leaves
3/4 tsp	paprika
1/2 tsp	rubbed sage
1/2 tsp	pepper
1 1/2 cups	water
1	6 ounce can tomato paste
2	10.5 ounce cans chicken broth
4 tbsp	cornstarch
1/3 cup	water

Cooking Time: LO = 8 to 10 hours **HI** = 5 to 6 hours

1. Place chicken parts, carrots, celery, mushrooms, onions and peas in ceramic cooking pot. In medium bowl combine salt, thyme, paprika, sage, pepper, water, tomato paste and broth. Pour over chicken mixture.
2. Place ceramic pot into heating base, cover and cook at desired heat setting for time given or until chicken and vegetables are tender.
3. Remove chicken pieces and set aside to cool slightly. Remove meat from bones and cut into bite-size pieces. Return meat to cooking pot; stir to combine.
4. Set control to HI. Combine cornstarch and water; stir slowly into stew until thickened. Serves 6 to 8. Set at LO for serving if desired.

Slow Cooker Stew		
2–2 1/2	lbs	beef stew meat, cut into 1-inch pieces
1		medium onion – chopped
6		carrots – cut into 1/2-inch pieces
4		ribs celery – cut into 1/2-inch pieces
5		medium potatoes – cut into 1/2-inch pieces
1		28 ounce can whole tomatoes – undrained – cut up
2		10.5 ounce cans beef broth
1 1/2	tbsp	worcestershire sauce
2	tbsp	dried parsley flakes
2		bay leaves
1 1/2	tsp	salt
1/2	tsp	pepper
3	tbsp	quick cooking tapioca

Cooking Time: LO = 8 to 10 hours **HI** = 5 to 6 hours

1. Combine all ingredients in ceramic cooking pot; stir to blend.
2. Place ceramic pot into the heating base, cover and cook at desired heat setting for time given or until meat and vegetables are tender. Remove bay leaves before serving. Serves 6 to 8. Set at LO for serving if desired.

Chili		
2	lbs	lean ground beef or turkey
1 1/2	cups	chopped onion
1 1/2	cups	chopped green pepper
2		garlic cloves - minced
3		28 ounce cans whole tomatoes – undrained – cut up
1		15 ounce can kidney beans - undrained
2 1/2	tbsp	chili powder
1 1/2	tsp	ground cumin
1 1/2	tsp	salt
3/4	tsp	pepper

Cooking Time: LO = 8 to 10 hours **HI** = 4 to 5 hours

1. Brown ground beef or turkey with onion, green pepper and garlic in skillet over medium heat of range unit. Remove excess grease. Transfer mixture into ceramic pot. Add remaining ingredients; stir to blend.
2. Place ceramic pot into heating base, cover and cook at desired heat setting for time given. Serves 6 to 8. Set at LO for serving, if desired.

Hearty Chicken Noodle Soup		
2–2 1/2	lbs	chicken parts, skinned if desired
6	cups	water
1		medium onion - chopped
6		carrots – cut into 1/2-inch pieces
5		ribs of celery – cut into 1/2-inch pieces
1		14.5 ounce can whole tomatoes – undrained – cut up
1 1/2	tbsp	instant chicken bouillon
1	tbsp	dried parsley flakes
1	tsp	salt
1/2	tsp	dried rosemary leaves
1/2	tsp	pepper
1	cup	uncooked fine egg noodles

Cooking Time: **LO** = 8 to 10 hours **HI** = 5 to 6 hours

1. Combine all ingredients, except egg noodles in the ceramic pot. Place cooking pot into heating base, cover and cook at desired heat setting for time given or until chicken and vegetables are tender.
2. Remove chicken pieces from ceramic pot and set aside to cool slightly. Set control to HI and add noodles, stirring to combine. Cover and continue to cook 30 minutes.
3. Remove chicken from bones and cut into bite-size pieces. Return meat to cooking pot and cook until noodles are tender. Serves 6 to 8. Set at LO for serving, if desired.

Corned Beef and Cabbage		
3 – 4	lbs	corned beef brisket
1		medium onion – sliced
1/2	tsp	celery seed
1/2	tsp	mustard seed
1		clove garlic – minced
1		bay leaf
1		small head cabbage – cut into wedges
		water

Cooking Time: **LO** = 8 to 10 hours

1. Place brisket with liquid and spices from package into ceramic cooking pot. Add onion, celery seed, mustard seed, garlic and bay leaf. Add just enough water to cover brisket. Cover and cook at LO for 8 to 10 hours or until brisket is fork tender.
2. During last hour of cooking, add cabbage wedges and continue cooking at LO. Discard cooking liquid and spices. Serves 6.

Minestrone Soup		
3	cups	water
2		10.5 ounce cans chicken broth
1		medium onion - chopped
3		carrots – diced
1		medium zucchini, halved and cut into 1/2 - inch slices
1 1/2	cups	cabbage - chopped
1		15 ounce can garbanzo beans - undrained
3		14.5 ounce cans whole tomatoes – undrained – cut-up
5		slices bacon – cooked & crumbled – optional
2		garlic cloves - minced
1 1/2	tsp	Italian seasoning
1	tsp	salt
1/2	tsp	pepper
3/4	cup	small elbow macaroni or other pasta - uncooked

Cooking Time: **LO** = 8 to 10 hours **HI** = 5 to 6 hours

1. Combine all ingredients, except macaroni in the ceramic pot; stir to blend. Place cooking pot into heating base, cover and cook at desired heat setting for time given or until vegetables are tender.
2. Increase heat to HI setting and add macaroni; stir to blend. Cover and cook for 30 minutes. Serves 6 to 8. Set at LO for serving, if desired.

Company Chicken		
3 - 4	lbs	chicken parts, skinned if desired
		salt and pepper to taste
2		10.5 ounce cans condensed cream of mushroom soup
2		10.5 ounce cans condensed tomato soup
1/4	cup	flour
2		cloves garlic – minced
1		16 ounce jar small whole onions – drained, **OR** 1 large onion - sliced and separated into rings

Cooking Time: **LO** = 8 to 10 hours **HI** = 5 to 6 hours

1. Season chicken parts with salt and pepper and place into ceramic cooking pot. In bowl, combine remaining ingredients, stirring well to blend. Pour over chicken.
2. Cover and cook at desired heat setting for time given or until chicken is tender. Serves 6 to 8. Set at LO for serving, if desired.

Herbed Pork Roast		
4		large garlic cloves – quartered
5	lbs	pork roast – boneless or bone-in
1	tsp	salt
1	tsp	ground thyme
1/2	tsp	rubbed sage
1/2	tsp	ground cloves
1	tsp	grated lemon peel
1/2	cup	water
3	tbsp	cornstarch - optional
3	tbsp	water - optional

Cooking Time: LO = 9 to 10 hours **HI** = 5 to 6 hours

1. Cut 16 small pockets into roast and insert garlic pieces. In small bowl combine salt, thyme, sage, cloves and lemon peel. Rub on pork roast.
2. Pour 1/2 cup water into the ceramic cooking pot. Add roast. Place pot into heating base, cover and cook at desired heat setting for time given or until meat thermometer inserted into center of roast reads 170°F or higher.
3. Allow roast to stand 10 to 15 minutes before carving. Remove garlic pieces. Juices may be thickened for gravy if desired. Dissolve cornstarch in water. Set control to HI. Stir slowly into juices until thickened. Serves 6 to 8.

Beef Roast with Vegetables		
3–3 1/2	lbs	beef roast
		salt and pepper to taste
1		large onion – quartered or sliced
6		carrots – cut into 1-inch pieces
6		medium potatoes – quartered and halved
1/2	cup	water

Cooking Time: LO = 9 to 10 hours **HI** = 5 to 6 hours

1. If desired, brown roast in skillet over medium heat of range unit before placing into ceramic cooking pot. Season as desired. Place vegetables around roast. Add water.
2. Place ceramic pot into heating base, cover and cook at desired heat setting for time given or until meat and vegetables are tender. (Meat thermometer should read 170°F for well done). Thicken juices with mixture of 2 tablespoons cornstarch and 2 tablespoons water if desired. Set control to HI and slowly stir mixture into juices until thickened. Serves 6. Set at LO for serving, if desired.

Product Warranty

Appliance 1 Year Limited Warranty

West Bend® Housewares, LLC warrants this appliance from failures in the material and workmanship for 1 year from the date of original purchase, provided the appliance is operated and maintained in conformity with the West Bend® Housewares, LLC Instruction Manual. Any failed part of the appliance will be repaired or replaced without charge at West Bend® Housewares, LLC discretion. This warranty applies to indoor household use only.

The West Bend® Housewares, LLC warranty does not cover any damage, including discoloration, to any non-stick surface of the appliance. The West Bend® Housewares, LLC warranty is null and void, as determined solely by West Bend® Housewares, LLC, if the appliance is damaged through accident, misuse or abuse, scratching, overheating, or if the appliance is altered in any way or if used outside of an indoor household setting.

This warranty gives you specific legal rights. You may also have other rights, which may vary from state to state.

THIS WARRANTY IS IN LIEU OF ALL IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, PERFORMANCE, OR OTHERWISE, WHICH ARE HEREBY EXCLUDED. IN NO EVENT SHALL WEST BEND® HOUSEWARES, LLC BE LIABLE FOR ANY DAMAGES, WHETHER DIRECT, IMMEDIATE, INCIDENTAL, FORESEEABLE, CONSEQUENTIAL, OR SPECIAL, ARISING OUT OF OR IN CONNECTION WITH ITS APPLIANCE.

If you think the appliance has failed or requires service within its warranty period, return it to the original place of purchase. For further details please contact the West Bend® Housewares Customer Service Department at (262) 334-6949 or e-mail us at housewares@westbend.com. Return shipping fees are non-refundable. Hand-written receipts are not accepted. West Bend Housewares, LLC is not responsible for returns lost in transit.

Valid only in USA and Canada

Replacement Parts

Replacement parts may be ordered direct from West Bend® Housewares, LLC by ordering online at www.westbend.com: Replacement Parts. Or you may call or e-mail the service department at the number/e-mail address listed above, or by writing to us at:

West Bend Housewares, LLC
Attn: Customer Service
P.O. Box 2780
West Bend, WI 53095

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Be sure to include the catalog/model number of your appliance (located on the bottom/back of the unit) and a description and quantity of the part you wish to order. Along with this include your name, mailing address, Visa/MasterCard number, expiration date and the name as it appears on the card. Checks can be made payable to West Bend Housewares, LLC Call Customer Service to obtain purchase amount. Your state's sales tax and a shipping/processing fee will be added to your total charge. Please allow two (2) weeks for delivery.

This manual contains important and helpful information regarding the safe use and care of your new West Bend® Housewares, LLC product. For future reference, attach dated sales receipt for warranty proof of purchase and record the following information:

Date purchased or received as gift: _____

Where purchased and price, if known: _____

Item Number and Date Code (shown bottom/back of product): _____

Garantía del producto

Garantía limitada de 1 año del aparato electrodoméstico

West Bend® Housewares, LLC garantiza que este aparato no presentará fallas de material ni fabricación durante 1 año a partir de la fecha original de compra, siempre y cuando el aparato sea operado y mantenido tal como se indica en el manual de instrucciones de West Bend® Housewares, LLC. Toda pieza del aparato que presente fallas será reparada o reemplazada sin costo alguno a criterio de West Bend® Housewares, LLC. Esta garantía rige solamente para el uso domestico en interiores.

La garantía de West Bend® Housewares, LLC no cubre ningún daño, incluyendo la decoloración, de superficie antiadherente alguna del aparato electrodoméstico. La garantía de West Bend® Housewares, LLC quedará nula e inválida, según lo determine exclusivamente West Bend® Housewares, LLC, si el aparato electrodoméstico resultase dañado debido a accidentes, uso indebido o abuso, rayas, sobrecalentamiento o si es alterado de algún modo o no se usa en forma doméstica y en interiores.

Esta garantía le otorga derechos legales específicos. Usted también puede tener otros derechos, los cuales pueden variar de una jurisdicción a otra.

ESTA GARANTÍA REEMPLAZA A TODAS LAS DEMÁS GARANTÍAS IMPLÍCITAS, INCLUYENDO AQUÉLLAS DE COMERCIABILIDAD E IDONEIDAD PARA UN FIN O USO EN PARTICULAR, LAS CUALES QUEDAN EXCLUIDAS MEDIANTE EL PRESENTE DOCUMENTO. WEST BEND® HOUSEWARES, LLC RECHAZA TODA RESPONSABILIDAD POR DAÑOS, YA SEAN DIRECTOS, INMEDIATOS, INCIDENTALES, PREVISIBLES, CONSECUENTES O ESPECIALES QUE SURJAN DEL USO DEL APARATO ELECTRODOMÉSTICO O GUARDEN RELACIÓN CON EL MISMO.

Si dentro del período de garantía usted considera que el aparato electrodoméstico presenta fallas o requiere servicio, devuélvalo al lugar de compra original. Para obtener mayores detalles comuníquese con el Departamento de Servicio al Cliente al (262) 334-6949 o por correo electrónico a housewares@westbend.com. Los gastos de devolución no son reembolsables. Los recibos escritos a mano no son válidos. West Bend Housewares, LLC no se hace responsable de las devoluciones perdidas en tránsito.

Válido sólo en EE.UU. y Canadá

Repuestos

Solicite los repuestos a West Bend® Housewares, LLC directamente en línea en www.westbend.com, "Replacement Parts", llamando o enviando un mensaje de correo electrónico al departamento de servicios al número/dirección antedichos o escribiendo a: West Bend Housewares, LLC Repuestos O puede llamarnos o enviarnos un mensaje de correo electrónico al departamento de servicios al número/dirección antedichos o escribiéndonos a:

West Bend Housewares, LLC
Attn: Customer Service
P.O. Box 2780
West Bend, WI 53095, EE.UU.

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Cerciórese de incluir el número de catálogo/modelo del aparato electrodoméstico (situado en la parte inferior/posterior de la unidad) así como la descripción y la cantidad de repuestos que necesita. Junto con esta información, incluya su nombre, dirección postal, número de tarjeta de crédito Visa o MasterCard, la fecha de vencimiento y el nombre tal como aparece en la tarjeta. Los cheques deben hacerse pagaderos a West Bend Housewares, LLC. Llame a Servicio a la Clientela para que le informen el monto de la compra. Se sumará al total el impuesto de venta estatal que corresponda, más un cargo por despacho y procesamiento. La entrega tarda dos (2) semanas.

Este folleto contiene información importante y útil sobre el uso seguro y el cuidado de su nuevo producto de West Bend® Housewares, LLC. Para su propia referencia, archive aquí el recibo fechado que sirve de comprobante de compra para la garantía, y anote la siguiente información:

Fecha en que compró o recibió la unidad como regalo:

_____

Dónde se efectuó la compra y el precio, si lo sabe:

_____

Número y código de fecha del producto (aparece en la parte inferior/posterior de la unidad):

_____

L5617 01/05 West Bend Housewares A Focus Products Group Company Printed in China

APPENDIX C

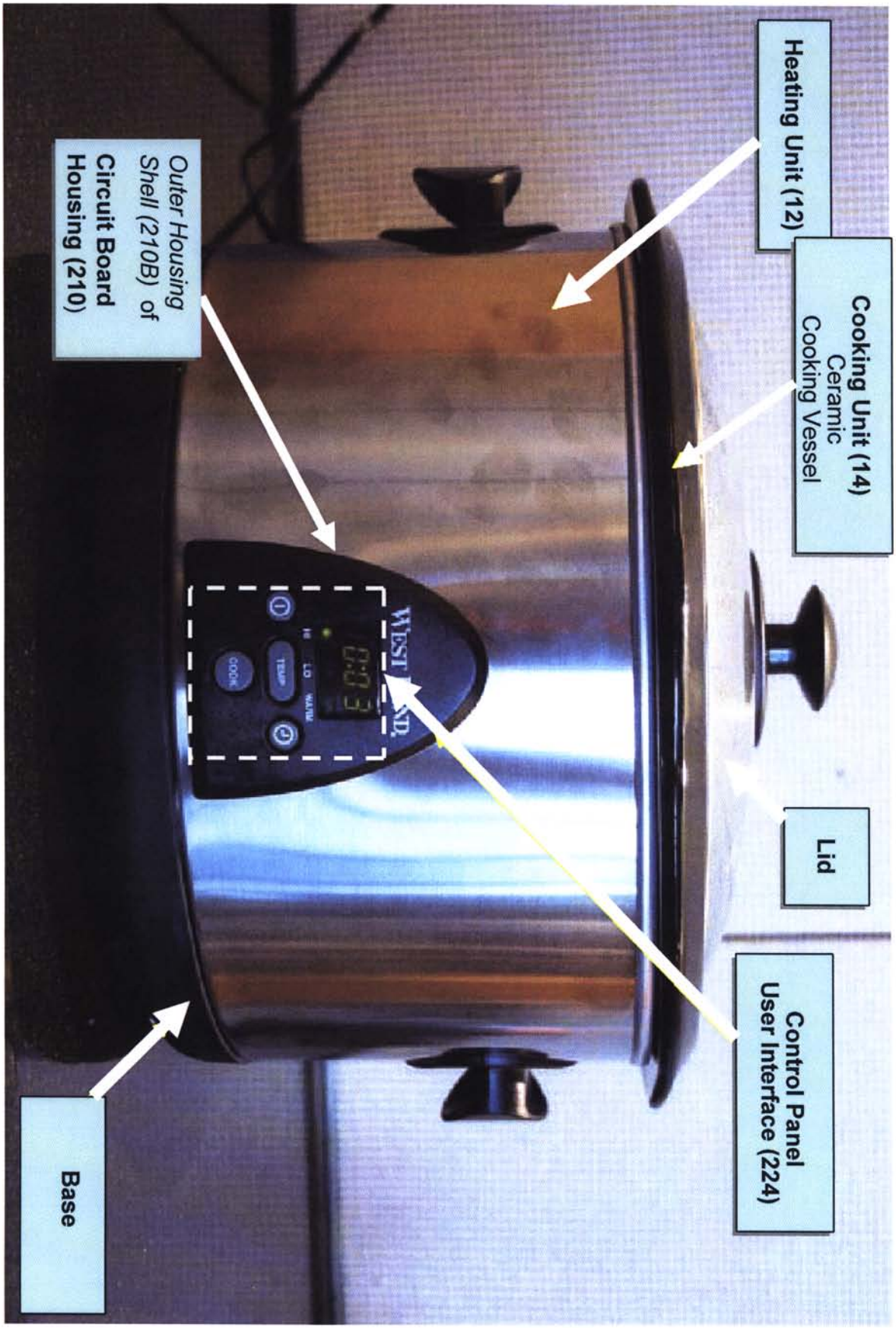

Photo 1 – *Front of Cooker*

Photo 2 – *Side of Cooker*

Photo 3 – *Ceramic Cooking Vessel*

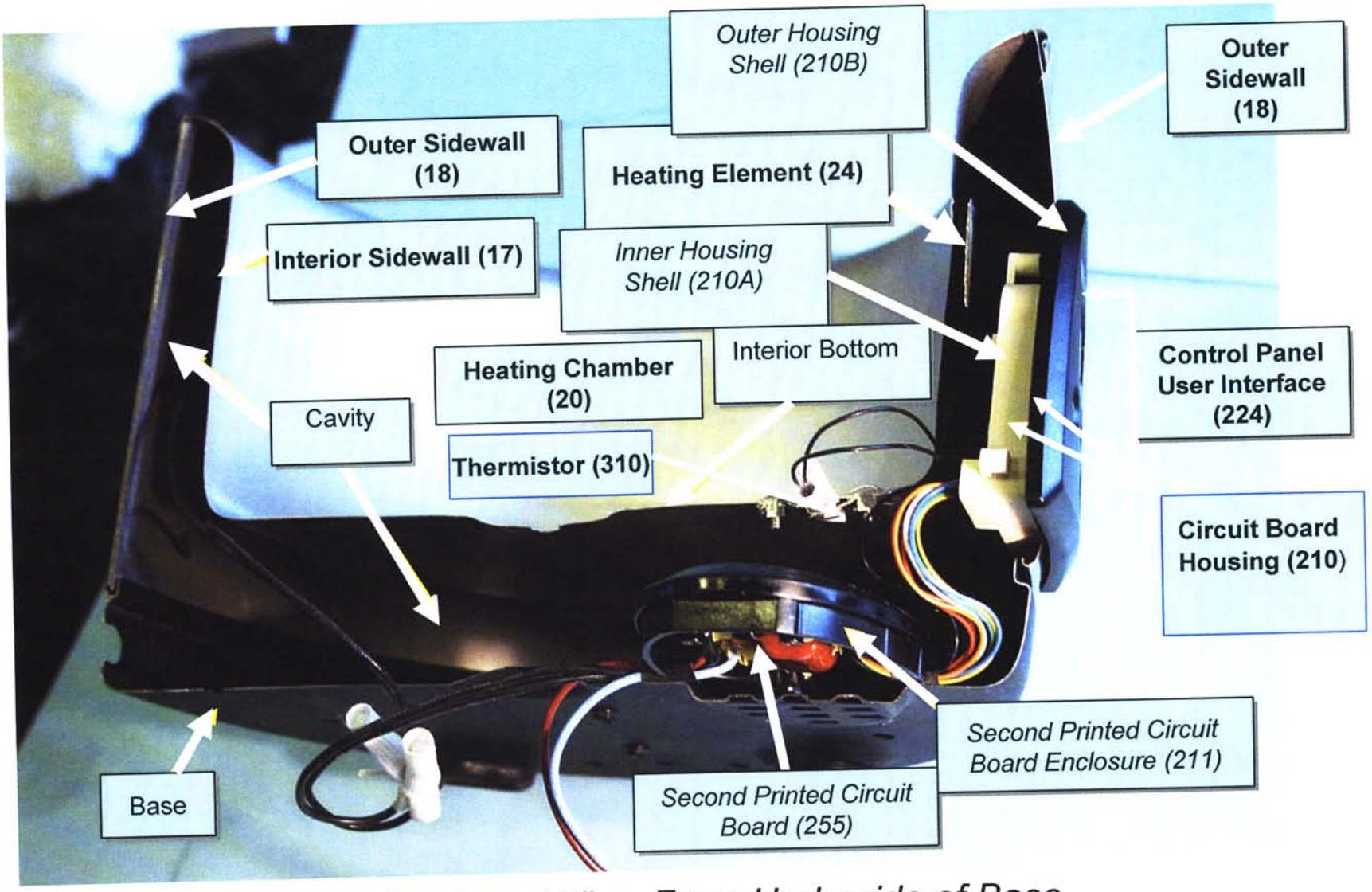

Photo 4 – *Sectioned View From Underside of Base*

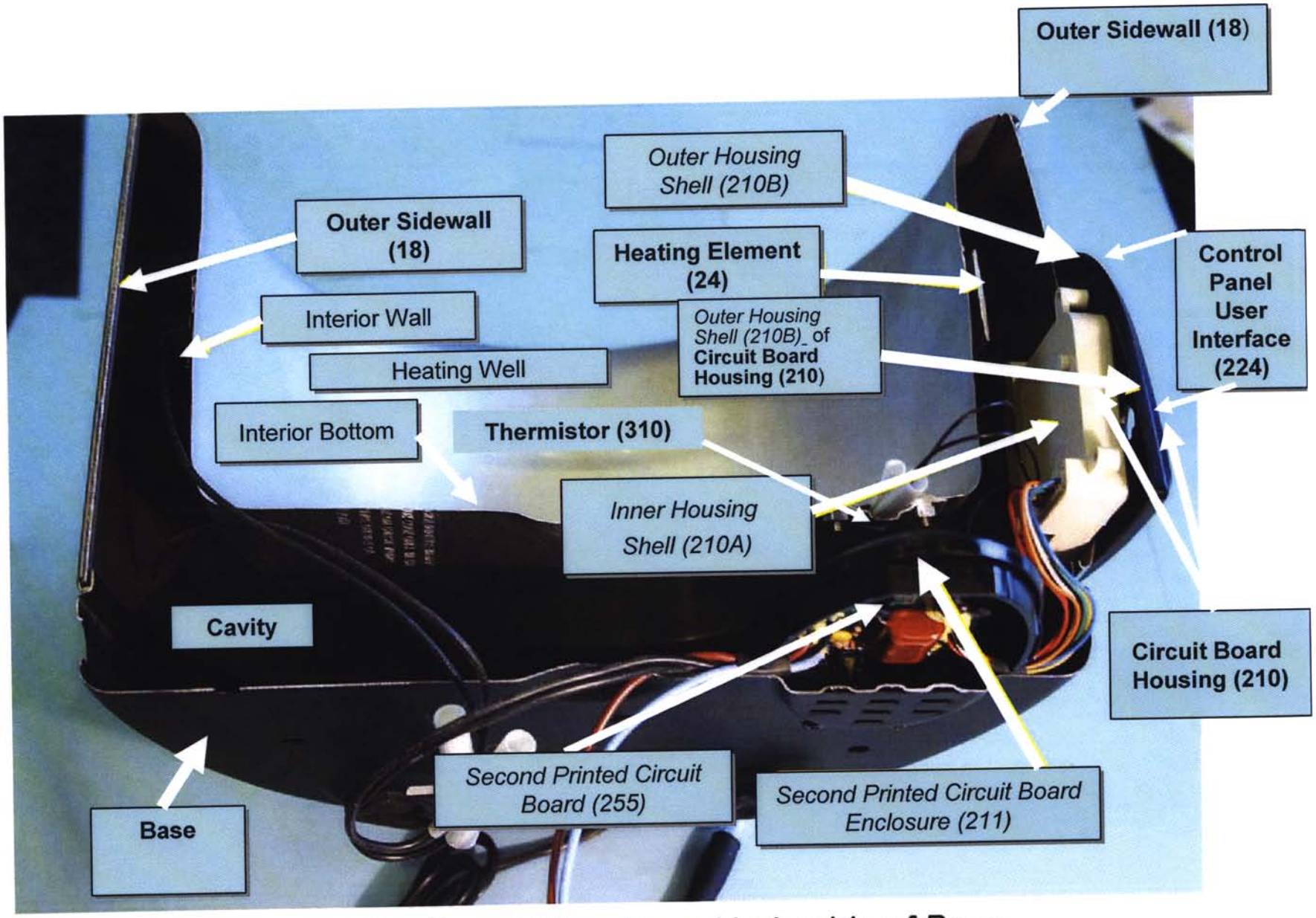

Photo 5 – *Sectioned View From Underside of Base*

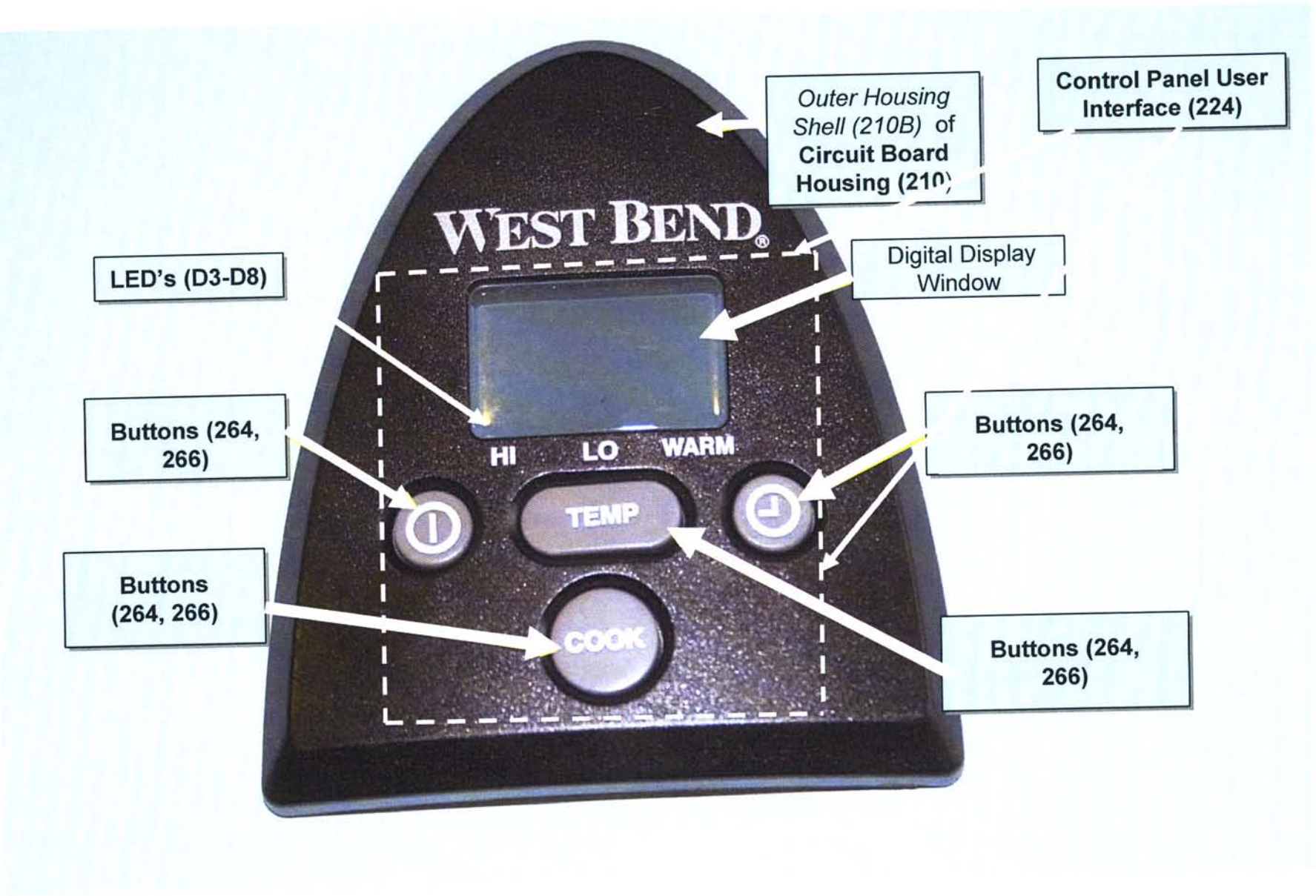

Photo 6 – Front View of *Outer Housing Shell (210B)* of Circuit Board Housing (210)

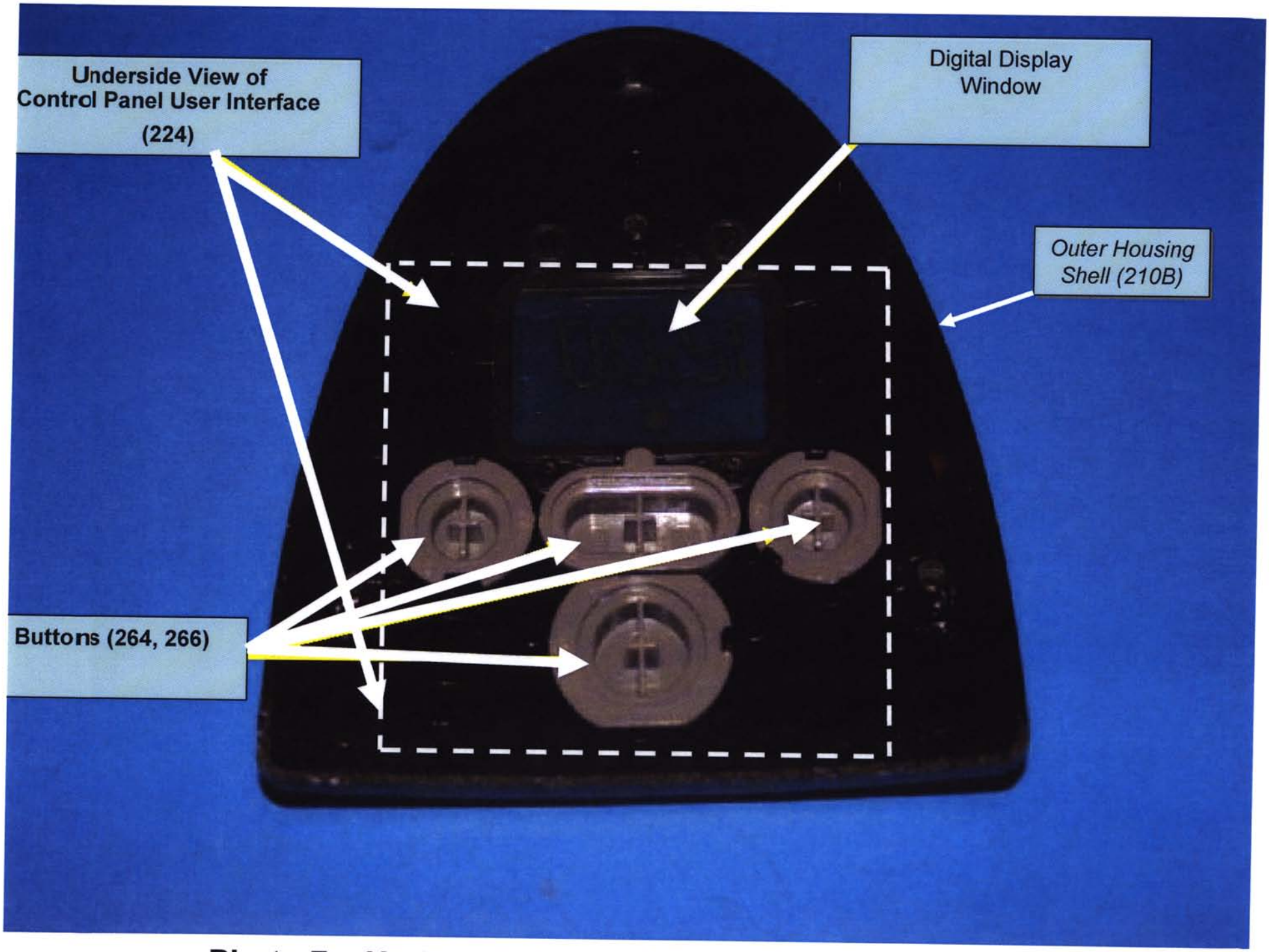

Photo 7 – Underside View of *Outer Housing Shell (210B)*

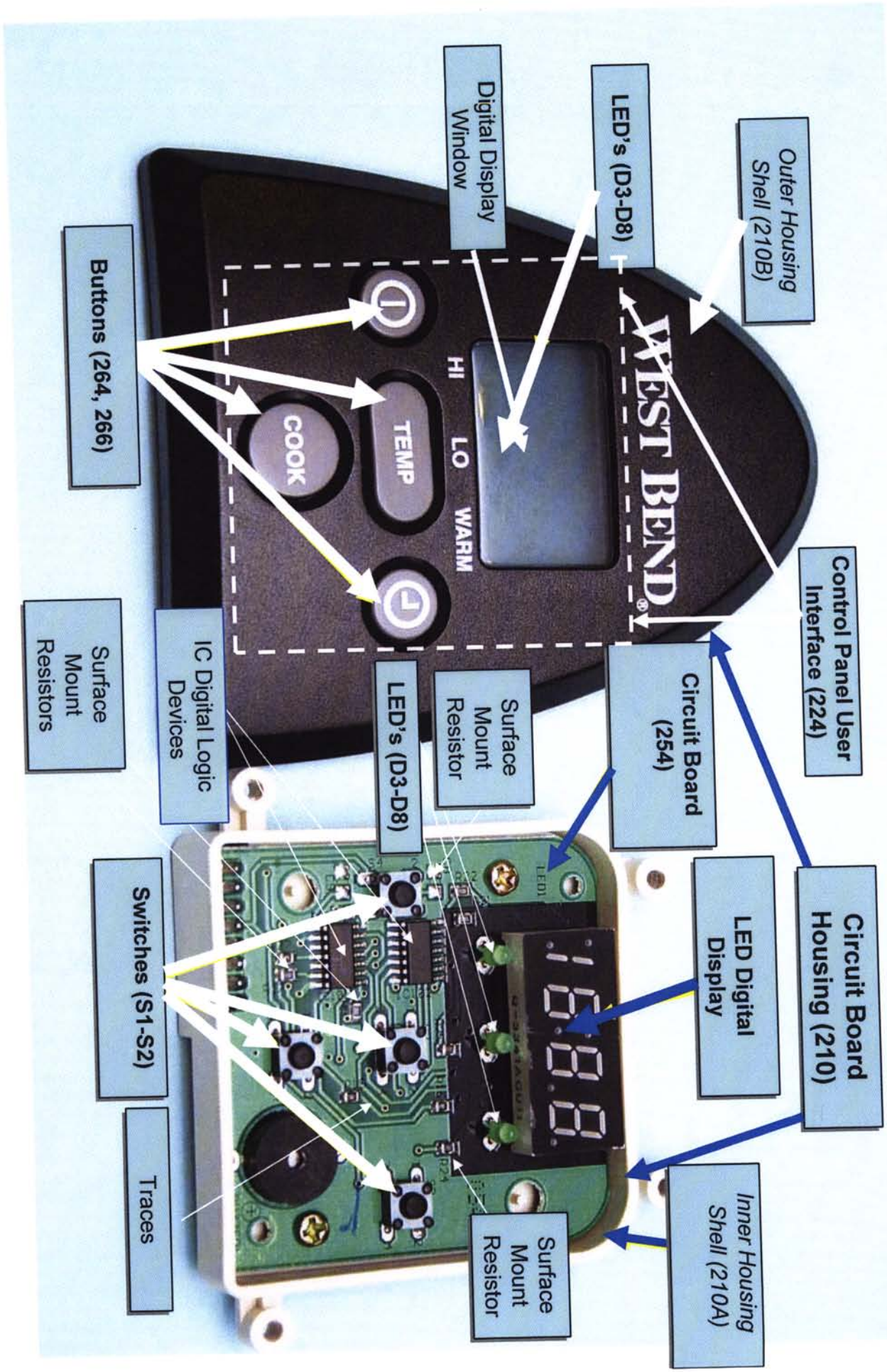

Photo 8 – Circuit Board Housing (210) and Circuit Board (254)

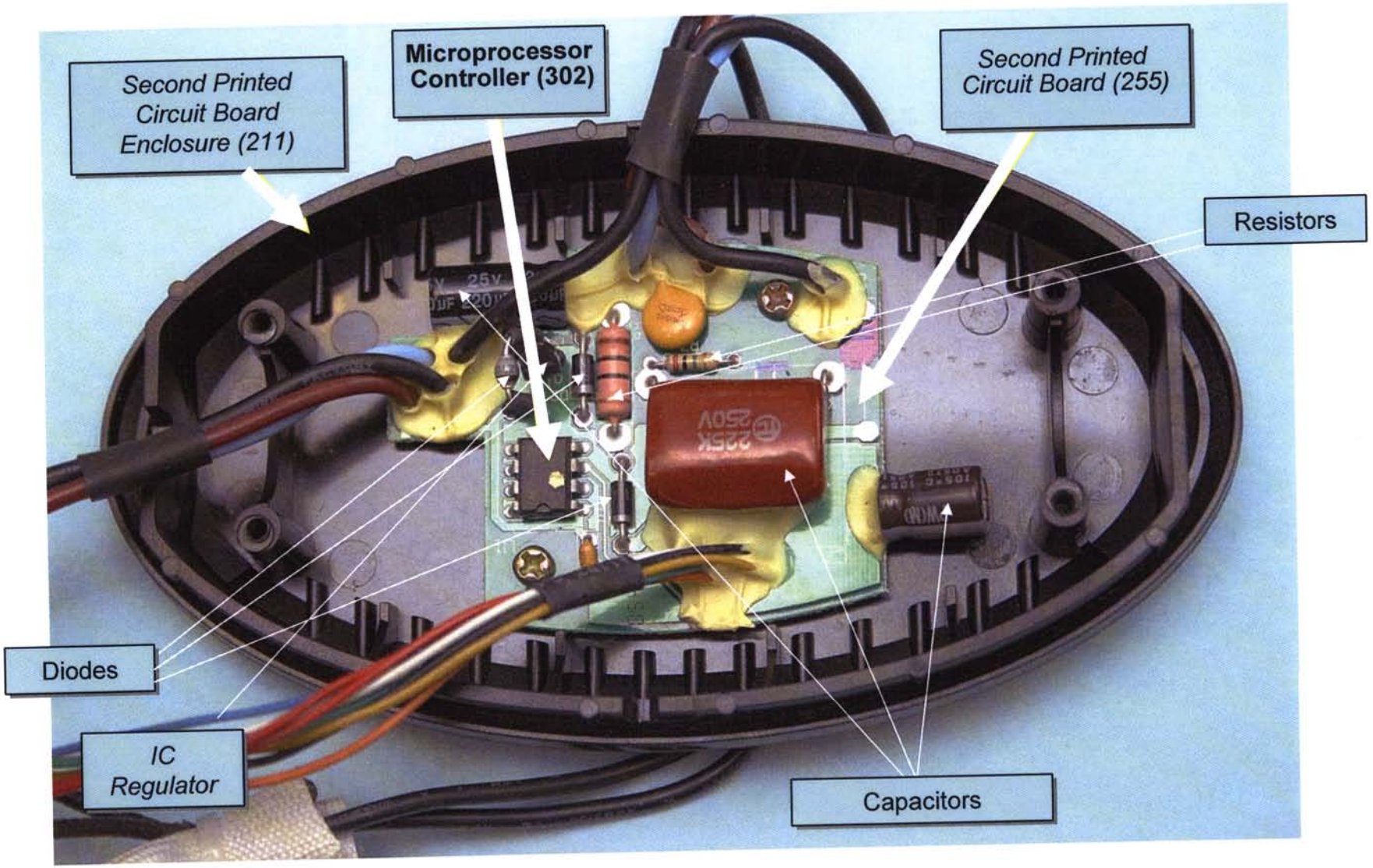

Photo 9 – *Second Printed Circuit Board Enclosure (211) Containing Second Printed Circuit Board (255)*

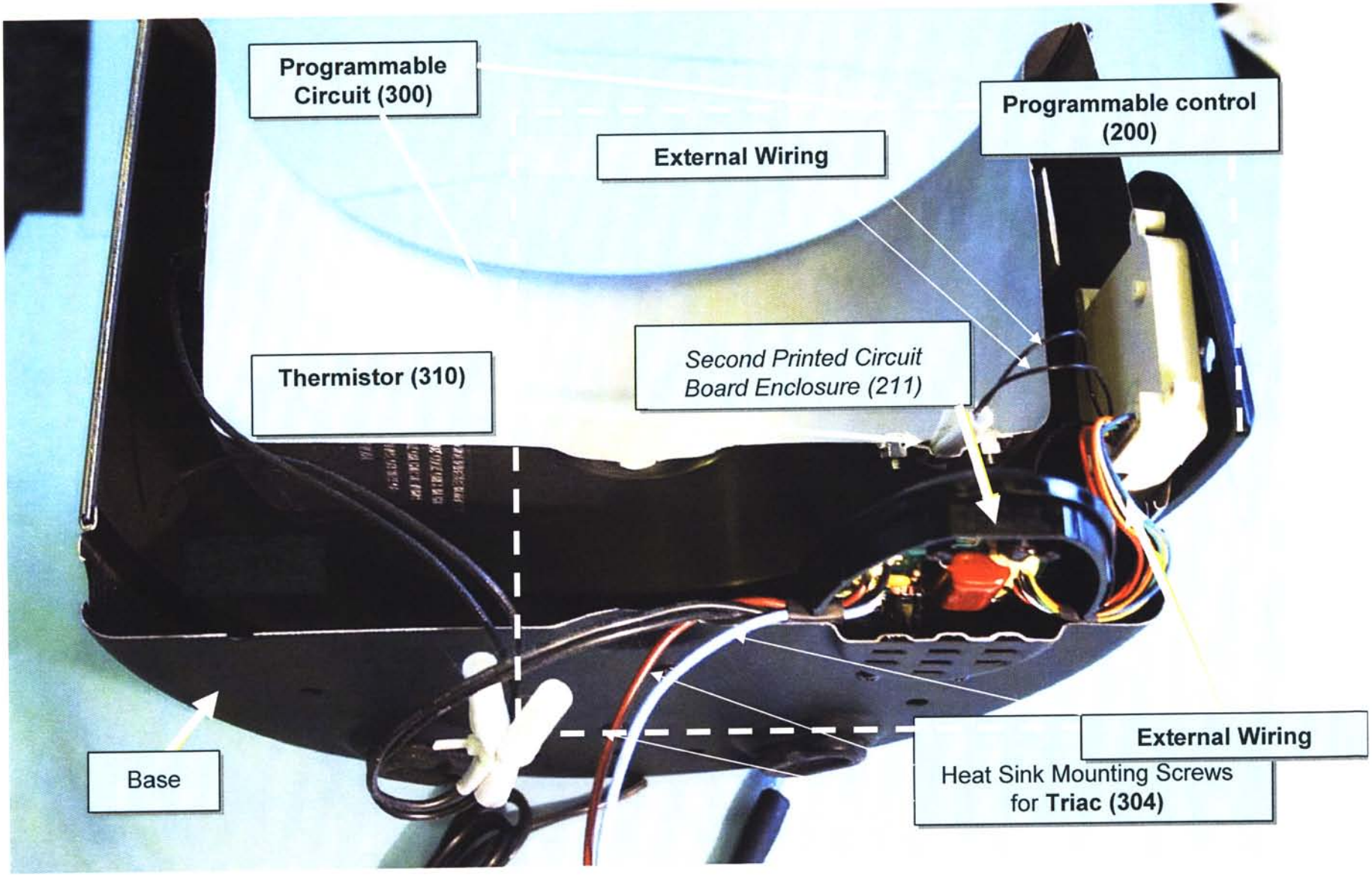

Photo 10 – *Cut-Away Side View of Cooker Showing Underside of Heating Unit Base*

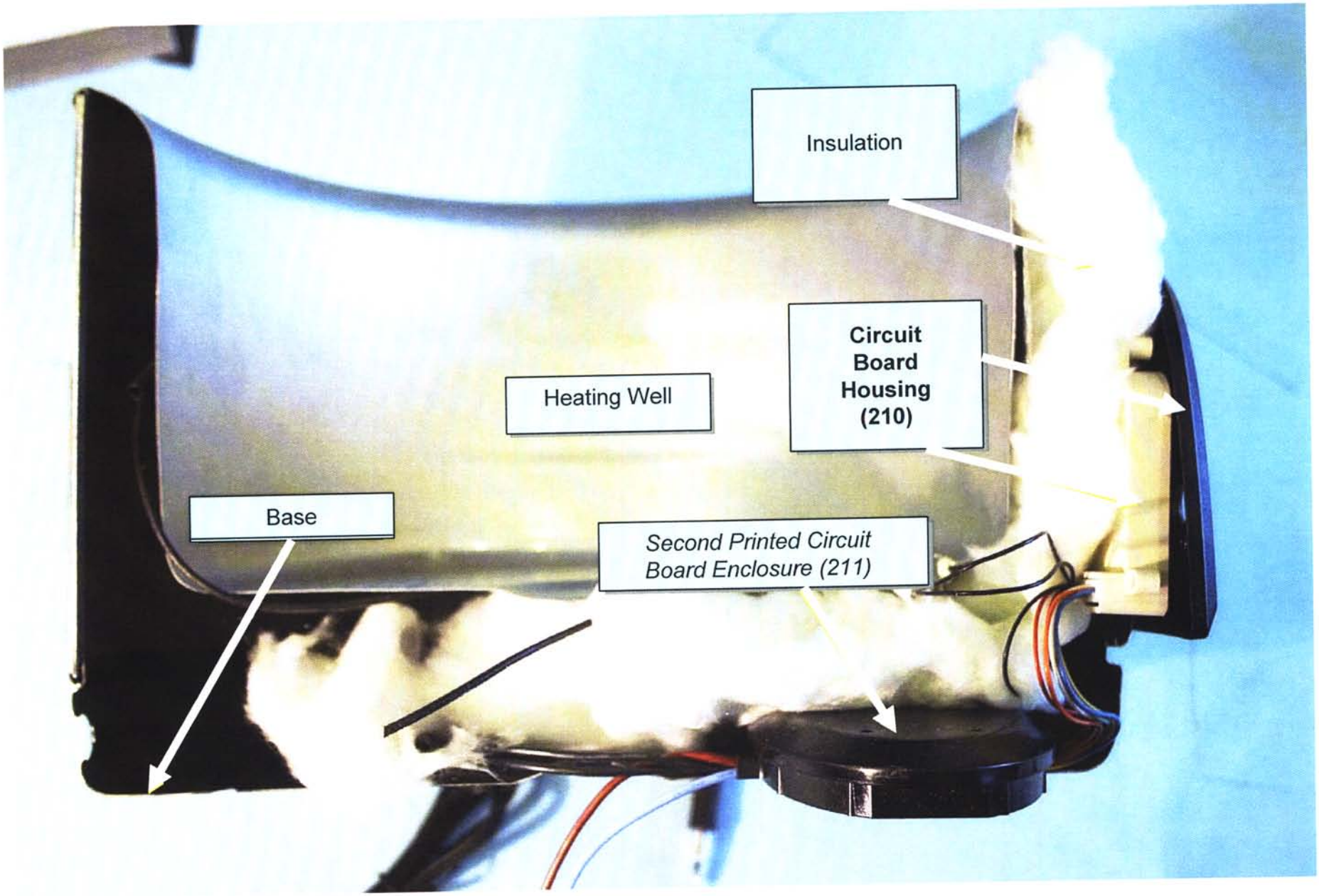

Photo 11 – *Cut-Away Side View of Cooker Showing Thermal Insulation Pad*

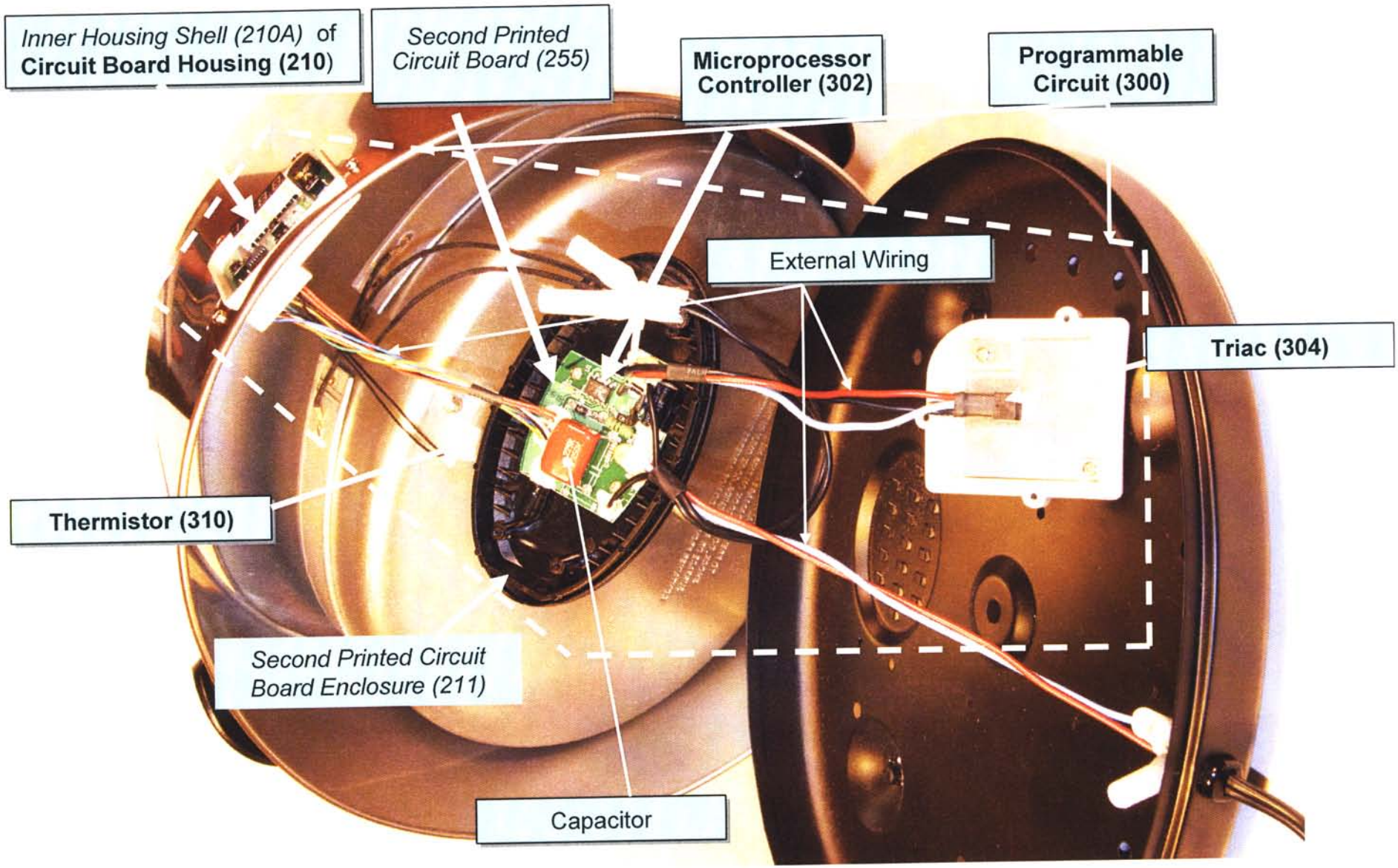

Photo 12 – Disassembled Bottom View of Cooker Showing Components of the Programmable Circuit (300)

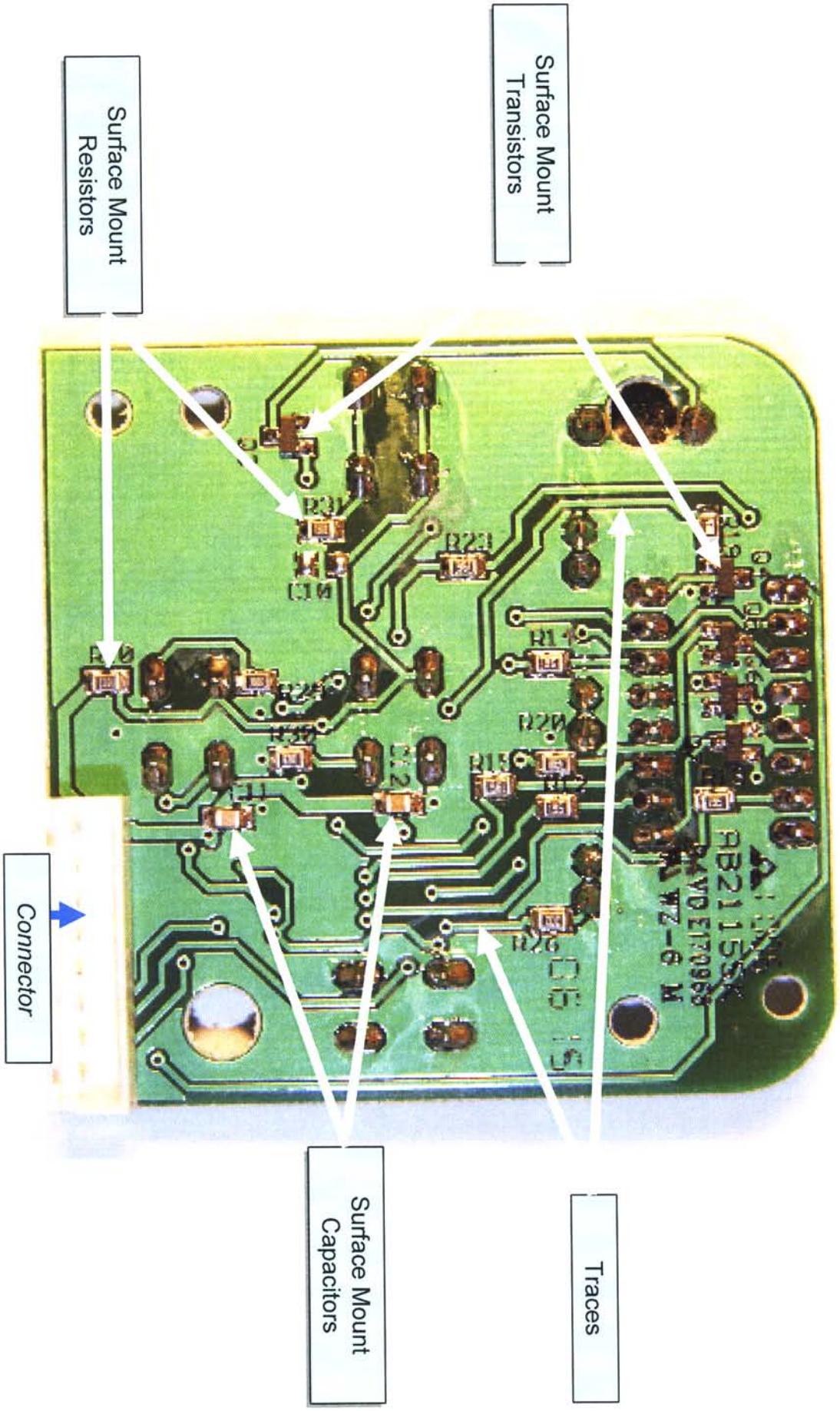

Photo 13 – Underside View of Circuit Board (254)

APPENDIX D

PLAINTIFF'S CLAIMS CONSTRUCTION & COMPARISON CHART

Claim 13 of United States Patent No. 6,573,483 ("the '483 Patent") is infringed by West-Bend's Electronic Crockery™ Cooker

1. Each and every non-disputed claim term of Claim 13 of the '483 Patent are present in the West Bend programmable slow-cooker.

Claim Term	***The Court's Claim Construction***	***Expert's Proposed Modified Claim Construction***	***West-Bend's Accused Device***
a programmable slow-cooker appliance [Cl. 13, Lines 1-2]	"a cooking device designed for cooking food at a constant relatively low cooking temperature for a relatively long period of time [being], being programmable to operate in a variety of different cooking modes and cooking times" [*Markman* Hearing Tr: Page 3, lines 7-12]	Agree with the Court's Claim Construction for this element. [Trumper Decl. ¶¶ 16-18]	APPENDIX B-*West Bend Housewares 6-Quart Electronic Crockery™ Cooker Instruction Manual.* At pages 4-11 describes the West Bend programmable slow-cooker as a cooking device designed for cooking food at constant, relatively-low cooking temperatures for a relatively long period of time, being programmable to operate in a variety of different cooking modes and cooking times. Pages 7-11 provide slow-cooker recipes for cooking at relatively low cooking temperatures for relatively long periods of times. Page 4 provides programming instructions for a variety of different cooking temperatures for relatively long periods of time. *Also see* photos 1, 2 (Appendix C) showing the accused West Bend programmable slow-cooker. [Trumper Decl. ¶¶ 19-21] As shown in Photos 1-4, West Bend's programmable slow-cooker includes a heating unit (12), and a cooking unit (14) in the form of a ceramic cooking vessel. The heating unit (12) is formed by an interior (17) an outer sidewall (18) and a bottom (16). The interior sidewall (17) and bottom (16) define a well-like heating chamber (20), which is shaped to receive the ceramic cooking unit (14). A heating element (24) is secured to an outer surface of the interior sidewall (17). (*See* Fig. 11 of the '483 Patent). The West Bend programmable slow-cooker also includes a programmable control (200), which includes a circuit board housing (210), programmable circuit (300), and a control panel user interface (224) on the front surface of housing (210), specifically on the front surface of the *outer housing shell (210B).* (See Photos 1, 10 and 12). The control panel user interface (224) has buttons for setting a cooking time and cooking temperature and *a*

			Digital Display Window for viewing light emitting diodes ("LED's") and digital readouts for indicating cooking time and cooking temperature. (*See*, Photos 1, 6 and 8; and the specification and drawings of the '483 Patent, Figs. 1, 2 & 5 and Col. 2, lines 33-63; Col. 3, lines 8-21 & 24-42.) [Trumper Decl. ¶ 22]
a programmable controller [Cl. 13, Lines 6-7]	"[is] a form of an electrical circuit or circuits including input and output devices which permit an operator to select a cooking temperature and cooking time." [*Markman* Hearing Tr: Page 20, lines 19-22]	Agree with the Court's Claim Construction for this element. Reference numerals added. An electrical circuit or circuits (300) including input and output devices (microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) & light emitting diodes (LED's) (D3-D8)) which permit an operator to select a cooking temperature and cooking time. [Trumper Decl. ¶¶ 23-27]	The West Bend programmable slow-cooker includes a programmable electrical circuit (300) as shown in Photographs 10 and 12, including input and output devices, for example a microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) and light emitting diodes (LED's) (D3-D8)), which permit an operator to select a cooking temperature and cooking time. [Trumper Decl. ¶ 28]

Claim 13 of United States Patent No. 6,573,483 ("the '483 Patent") is infringed by West-Bend's Electronic Crockery™ Cooker continued

mounted to a housing fixedly mounted to a heating unit [Cl. 13, Lines 7-8]	"[the housing is] mounted to and located on the …outside, or at least overwhelmingly or generally outside…of the heating unit." [Tr: Page 20, lines 24-25; Page 21, lines 2-3; and Page 24, lines 1-2]	A housing (210) **fixedly** mounted to *[and largely outside]* the outer sidewall (18) of the heating unit (12) and extending at least beyond an outer surface of the sidewall (18) of the heating unit (12). [Trumper Decl. ¶¶ 29-33]	The West Bend Programmable slow-cooker, as shown in Photos 4-6, 8 and 10, the West Bend programmable slow-cooker includes a printed circuit board housing (210) formed by *an inner housing shell (210A) (white plastic) and an outer housing shell (210B)*. The control panel user interface (224) is located on the front face of the *outer housing shell (210B)*. The outer sidewall (18) of the West Bend programmable slow-cooker has a cutout to accommodate the printed circuit board housing (210) enclosure and provide access for wires connecting to electronic components of the programmable circuit (300) mounted within the heating unit (12). (In particular, see Photos 10 and 12). The *inner housing shell (210A)* is attached to the inner surface of outer sidewall (18) by screws which are fastened from the outside of the heating unit outer sidewall (18). The *outer housing shell (210B)* covers the *inner housing shell (210A)* and is affixed to the exterior of the outer sidewall (18) of the heating unit (12) by screws fastened from the inside of the outer sidewall (18). The *inner housing shell (210A)* and *outer housing shell (210B)* having the control panel user interface (224) on its front face form the circuit board housing (210) enclosure, which is mounted to and located on the outer sidewall (18) of the heating unit (18). [Trumper Decl. ¶ 35] As can be seen in Photos 1, 2, 5, 10 and 12, both the *inner housing shell (210A)* and the *outer housing shell (210B)* are fixedly mounted by screws to, and extend beyond, the outer surface of the sidewall (18) of the heating unit (12). The entire *outer housing shell (210B)* extends outwardly from the outer side wall. [Trumper Decl. ¶ 36] **Infringement under the Doctrine of Equivalents** The West Bend device infringes this claim element under the doctrine of equivalents. By placing a portion of the housing (210) within the heating unit (12), West Bend has merely made an insubstantial change which

			accomplishes the function of the invention (i.e., programming a cooking time and temperature and automatically changing the heating unit temperature from a cooking mode to a lower temperature warm mode at the end of a selected time) in substantially the same way to achieve substantially the same result. [Trumper Decl. ¶ 37] The way to achieve the function is by providing a circuit (300) which can program a cooking time and temperature. Additionally, the circuit is (300) configured to automatically change power to the heating element to switch from a cooking mode to a lower temperature warm mode at the expiration of a set cooking time. Clearly, West Bend's device includes a circuit (300) to accomplish these functions. With respect to the housing (210), West Bend's device includes a housing (210) fixedly mounted to the heating unit (12). West Bend's housing (210) or enclosure includes portions which extend both into the heating unit (12) as well as projecting outwardly beyond the outer surface of the outer sidewall (18) of the heating unit (12). Accordingly, should the Court require the housing to be "overwhelmingly" or "largely" outside of the outer sidewall (18) of the heating unit (12), the West Bend device would still infringe under the doctrine of equivalents since the housing accomplishes the function of providing an enclosure (210) for the programmable controller (300) in substantially the same way to achieve substantially the same result of the claim limitation, as construed by the Court. [Trumper Decl. ¶ 38] Should the Court hold that the housing limitation is not literally present, any differences in the West Bend structure are merely insubstantial and do not avoid infringement under the doctrine of equivalents. The function of the housing (210) is to provide an enclosure for at least a portion of the programmable circuit. The way in which this function is accomplished is by providing housing portions which are fixedly mounted to the outer sidewall of the heating unit to form the enclosure (210). The result is substantially the same since the enclosure (210) projects outwardly beyond an outer surface of the sidewall (18). The Court has suggested that the

			housing project "largely outside," the outer sidewall; however, this limitation does not appear in either the claim language or the specification. Accordingly, West Bend's accused structure, if not literally present, is clearly an insubstantial change which would constitute an infringement under the doctrine of equivalents. [Trumper Decl. ¶ 39]

Claim 20 of United States Patent No. 6,740,855 ("the '855 Patent") is infringed by West-Bend's Electronic Crockery™ Cooker

2. Each and every non-disputed claim term of Claim 20 of the '855 Patent are present in the West Bend programmable slow-cooker.

Claim Term	***The Court's Claim Construction***	***Expert's Proposed Modified Claim Construction***	***West-Bend's Accused Device***
A programmable slow-cooker appliance [Cl. 20, Lines 1-2]	"A cooking device designed for cooking food at a constant relatively low cooking temperature for a relatively long period of time [being], being programmable to operate in a variety of different cooking modes and cooking times," [*Markman* Hearing Tr: Page 3, lines 7-12; Page 25, lines 8-15]	Agree with the Court's Claim Construction for this element. [Trumper Decl. ¶¶ 16-18]	APPENDIX B-*West Bend Housewares 6-Quart Electronic Crockery™ Cooker Instruction Manual.* At pages 4-11 describes the West Bend programmable slow-cooker as a cooking device designed for cooking food at constant, relatively-low cooking temperatures for a relatively long period of time, being programmable to operate in a variety of different cooking modes and cooking times. Pages 7-11 provide slow-cooker recipes for cooking at relatively low cooking temperatures for relatively long periods of times. Page 4 provides programming instructions for a variety of different cooking temperatures for relatively long periods of time. *Also see* photos 1, 2 (Appendix C) showing the accused West Bend programmable slow-cooker. [Trumper Decl. ¶¶ 19-21] As shown in Photos 1-4, West Bend's programmable slow-cooker includes a heating unit (12), and a cooking unit (14) in the form of a ceramic cooking vessel. The heating unit (12) is formed by an interior (17) an outer sidewall (18) and a bottom (16). The interior sidewall (17) and bottom (16) define a well-like heating chamber (20), which is shaped to receive the ceramic cooking unit (14). A heating element (24) is secured to an outer surface of the interior sidewall (17). (*See* Fig. 11 of the '483 Patent). The West Bend programmable slow-cooker also includes a programmable control (200), which includes a circuit board housing (210), programmable circuit (300), and a control panel user interface (224) on the front surface of housing (210), specifically on the front surface of the *outer housing shell (210B)*. (See Photos 1, 10 and 12). The control panel user interface (224) has buttons for setting a cooking time and cooking temperature and *a Digital Display Window* for viewing light emitting diodes ("LED's") and digital readouts for indicating cooking time and cooking temperature.

			(*See*, Photos 1, 6 and 8; and the specification and drawings of the '483 Patent, Figs. 1, 2 & 5 and Col. 2, lines 33-63; Col. 3, lines 8-21 & 24-42.)
a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit [Cl. 20, Lines 10-11]	"that it is [a housing] mounted to and largely outside the outer sidewall of the heating unit and extending at least beyond an outer surface of the sidewall of the heating unit " [*Markman* Hearing Tr: Page 35, lines 5-9]	A housing (210) **fixedly** mounted to *[and largely outside]* the outer sidewall (18) of the heating unit (12) and extending at least beyond an outer surface of the sidewall (18) of the heating unit (12). [Trumper Decl. ¶¶ 30-33]	The West Bend Model No. 84386 programmable slow-cooker, as shown in Photos 1, 2 and 4, 5 & 8, includes a printed circuit board housing (210) formed by *an inner housing shell (210A) (white plastic) and an outer housing shell (210B)*. The control panel user interface (224) is located on the front face of the *outer housing shell (210B)(black plastic)*. The outer sidewall (18) of the West Bend programmable slow-cooker has a cutout to accommodate the printed circuit board housing (210) enclosure and provide access for wires connecting to electronic components of the programmable circuit (300) mounted within the heating unit (12). (In particular, see Photos 10 and 12). The *inner housing shell (210A)* is attached to the inner surface of outer sidewall (18) by screws which are fastened from the outside of the heating unit outer sidewall (18). The *outer housing shell (210B)* covers the *inner housing shell (210A)* and is affixed to the exterior of the outer sidewall (18) of the heating unit (12) by screws fastened from the inside of the outer sidewall (18). The *inner housing shell (210A)* and *outer housing shell (210B)* having the control panel user interface (224) on its front face form the circuit board housing (210) enclosure, which is mounted to and located on the outer sidewall (18) of the heating unit (18). [Trumper Decl. ¶ 35] As shown in Photos 1, 2, 5, 10 and 12, both the *inner housing shell (210A)* and the *outer housing shell (210B)* are fixedly mounted by screws to, and extend beyond, the outer surface of the sidewall (18) of the heating unit (12). The entire *outer housing shell (210B)* extends outwardly from the outer side wall. [Trumper Decl. ¶ 36] **Infringement under the Doctrine of Equivalents** The West Bend device infringes this claim element under the doctrine of

			equivalents. West Bend's portion of the housing (210) within the heating unit (12), is merely an insubstantial change which accomplishes the function of the invention (i.e., programming a cooking time and temperature and automatically changing the heating unit temperature from a cooking mode to a lower temperature warm mode at the end of a selected time) in substantially the same way to achieve substantially the same result. [Trumper Decl. ¶ 37] The way to achieve the function is by providing a circuit (300) which can program a cooking time and temperature. Additionally, the circuit is (300) configured to automatically change power to the heating element to switch from a cooking mode to a lower temperature warm mode at the expiration of a set cooking time. Clearly, West Bend's device includes a circuit (300) to accomplish these functions. With respect to the housing (210), West Bend's device includes a housing (210) fixedly mounted to the heating unit (12). West Bend's housing (210) or enclosure includes portions which extend both into the heating unit (12) as well as projecting outwardly beyond the outer surface of the outer sidewall (18) of the heating unit (12). Accordingly, should the Court require the housing to be "overwhelmingly" or "largely" outside of the outer sidewall (18) of the heating unit (12), the West Bend device would still infringe under the doctrine of equivalents since the housing accomplishes the function of providing an enclosure (210) for the programmable controller (300) in substantially the same way to achieve substantially the same result of the claim limitation, as construed by the Court. [Trumper Decl. ¶ 38] Should the Court hold that the housing limitation is not literally present, any differences in the West Bend structure are merely insubstantial and do not avoid infringement under the doctrine of equivalents. The function of the housing (210) is to provide an enclosure for at least a portion of the programmable circuit. The way in which this function is accomplished is by providing housing portions which are fixedly mounted to the outer sidewall of the heating unit to form the enclosure (210). The result is substantially the same since the enclosure (210) projects outwardly beyond

			an outer surface of the sidewall (18). The Court has suggested that the housing project "largely outside," the outer sidewall; however, this limitation does not appear in either the claim language or the specification. Accordingly, West Bend's accused structure, if not literally present, is clearly an insubstantial change which would constitute an infringement under the doctrine of equivalents. [Trumper Decl. ¶ 39]

Claim 20 of United States Patent No. 6,740,855 ("the '855 Patent") is infringed by West-Bend's Electronic Crockery™ Cooker continued

a programmable circuit positioned within said housing [Cl. 20, Line 12]	"a circuit, including an assemblage of electronic components, which allows the user to program both the temperature and desired time for cooking and which can automatically change the heating element from a cooking mode to a warm mode once the set cooking time has expired. The circuit, not just a portion of the circuit, is positioned within the housing. The programmable circuit does not include the heating element, the control panel, displays, and buttons." [*Markman* Hearing Tr: Page 38, lines 12-21]	A circuit (300), including an assemblage of electronic components (microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) & light emitting diodes (LED's)(D3-D8)) which allows the user to program both the temperature and desired time for cooking and which can automatically change the heating element (24) from a cooking mode to a warm mode once the set cooking time has expired. … The programmable circuit (300) does not include the heating element (24), the control panel (220), displays (57), and buttons (264, 266). [Trumper Decl. ¶¶ 22-27 & 40] *[The circuit, not just a portion of the circuit, is positioned within the housing.]* **Components of the circuit (300) are mounted on a printed circuit board (254) inside the housing (210).** [Trumper Decl. ¶¶ 41-44]	The West Bend Model No. 84386 programmable slow-cooker, as shown in Photos 4, 5, 8-10, 12 and 13 includes "a programmable circuit," namely, "a circuit (300), including an assemblage of electronic components (microprocessor controller (302), Triac (304), thermistor (310), switches (S1-S2) & light emitting diodes (LED's)(D3-D8)) which allows the user to program both the temperature and desired time for cooking and which can automatically change the heating element (24) from a cooking mode to a warm mode once the set cooking time has expired. Components of the circuit (300), namely switches (S1-S2) & light emitting diodes (LED's)(D3-D8)), surface mounted resistors, capacitors and electronic logic devices (IC's) connected to the other components of the programmable circuit (300) with traces on the surface of the printed circuit board (254) and by external wiring, which allows the user to program both the temperature and desired time for cooking are mounted on a printed circuit board (254) inside the housing (210). [Trumper Decl. ¶¶ 28 & 45] The West Bend Crockery slow-cooker includes components of the programmable circuit (300) on printed circuit board (254) inside printed circuit board housing (254). (See Photos 10 and 12). These include LED's, switches, IC digital logic devices, traces connecting these and surface mount components, including resistors, capacitors; and on the backside of circuit board (224) there are traces connecting circuit elements, surface mount components, including resistors, capacitors and transistors. (See Photos 8 and 13). Other components of the programmable circuit (300), including microprocessor controller (302), resistors diodes and capacitors are positioned on a *second printed circuit board (255)* in a *second printed circuit board enclosure (211)*, which is connected by wires to printed circuit board (254) and to Triac (304). The *second printed circuit board (255)* is mounted in a *second printed circuit board enclosure (211)* and is located on the underside of the heating unit (12). The thermistor

			(310) is connected by wires to the printed circuit board (254). The programmable circuit (300) does not include the heating element (24), the control panel (220), displays (57), and buttons (264, 266). [Trumper Decl. ¶¶ 46-48] **Infringement under the Doctrine of Equivalents** The West Bend device infringes this claim element under the doctrine of equivalents. West Bend's programmable circuit (300) is not entirely within the housing; however, a printed circuit board (254) including electronic components which permit a user to select a cooking time and temperature is positioned within the housing (210). The circuit (300) as a whole, including both printed circuit boards (254 and *255*), the thermistor (310) and Triac (304), works in exactly the same way as the programmable circuit (300) disclosed in the '483 and '855 Patents. The only difference is that some electronic components are provided on a *second printed circuit board* (*255*) located within the heating unit rather than the housing. Splitting the printed circuit board components of the programmable circuit (300) into two circuit boards which are connected by wires is an insubstantial change readily apparent to a person of ordinary skill in the art. The West Bend programmable circuit (300) performs all the claimed functions (selecting a cooking time and temperature and automatically changing the heating element from a cook mode to a warm mode once the set time has expired) in substantially the same way to achieve substantially the same result. Merely splitting one circuit board component of the programmable circuit into two circuit boards connected by wires does not change the function, way, or result of the circuit (300). Thus, the West Bend device infringes Claim 20 as construed by the Court under the doctrine of equivalents. [Trumper Decl. ¶¶ 46-48]

EXHIBIT E

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

Civil Action
No. 05-11367-WGY

THE HOLMES GROUP, INC.,

Plaintiff,

v.

WEST BEND HOUSEWARES, LLC and FOCUS PRODUCTS GROUP, LLC,

Defendants.

MARKMAN HEARING

BEFORE: The Honorable William G. Young,
District Judge

APPEARANCES:

HOFFMANN & BARON, LLP (By Charles R. Hoffmann, Esq. and Glenn T. Henneberger, Esq.) 6900 Jericho Turnpike, Syosset, New York 11791-4407, on behalf of the Plaintiff

BROMBERG & SUNSTEIN LLP (By Erik Paul Belt, Esq.), 125 Summer Street, Boston, Massachusetts 02110-1618

- and -

MICHAEL BEST & FRIEDRICH LLP (By Michael E. Husmann, Esq. and Joseph T. Miotke, Esq.), 100 East Wisconsin Avenue, Suite 3300, Milwaukee, Wisconsin 53202-4108, on behalf of the Defendants

1 Courthouse Way
Boston, Massachusetts

September 27, 2006

THE CLERK: All rise. Court is in session, please be seated.

Calling Civil Action 05-11367, the Holmes Group v. West Bend.

THE COURT: Good afternoon.

COUNSEL: Good afternoon, your Honor.

THE COURT: If counsel would identify themselves.

MR. HOFFMANN: Charles Hoffmann for the plaintiff.

MR. HENNEBERGER: Glenn Henneberger for the plaintiff.

MR. HUSMANN: Appearing for the defendant, Mike Husmann and Joe Miotke.

MR. BELT: Erik Belt from Bromberg & Sunstein.

THE COURT: Yes. Well, good afternoon.

Well, I owe you people a significant debt of gratitude. It seems to me you have narrowed the matters that we must consider quite a bit and I've found your briefs actually very helpful. So, hopefully we can, we can get to the, to the issues here and get through them in some reasonable fashion.

(Pause in proceedings.)

THE COURT: All right, I think I'm ready now.

I propose, though some of the language is the same in each of the two patents, I propose to start with the '483 patent, claim 13, and the word programmable, the phrase

"programmable slow-cooker."

Now, West Bend doesn't think that I even ought construe that, but actually I think Holmes' proposal, while too detailed, is a good place to start. So let me, let me propose a definition and we'll let you see if you're, if you're satisfied with it.

I would propose to define programmable slow-cooker appliance, as follows: A cooking device designed for cooking food at a constant, relatively low cooking temperature for a relatively long period of time being, being programmable to operate in a variety of different cooking modes and cooking times.

Now, we'll start with Holmes. Are you okay with that?

MR. HOFFMANN: I think that's okay, your Honor.

THE COURT: All right, fine. And how about, how about West Bend? That, that ought to be all right, shouldn't it?

MR. HUSMANN: Well, I think, your Honor, that the phrase "relatively low, constant temperature, relatively short time," whatever it is, is too vague. It doesn't give any definition. It adds words to the claim that are vague in themselves. A relatively low temperature, it's relative depending upon what food you're cooking, or if you compare -- you know, if you cook a turkey ten hours, is that

a long time?

THE COURT: No. But I, I take --

MR. HUSMANN: But is it relatively --

THE COURT: I take your point. I take your point. But you don't proffer a suggestion. And, of course, at this stage, I don't know what turns on this. Are we going to have to define a time because yours will work over X amount of hours and theirs will work over Y amount of hours? This is a slow-cooker. Slow cooking -- and you're -- and I'm no cook. Everything I say now here comes from my wife. I have not consulted her on this case. I do not discuss those cases. But slow cooking is, the time that it takes to cook --

MR. HUSMANN: Yes.

THE COURT: -- is, it's slow. So you can cook at lower temperatures and achieve a different food result. I mean, that's --

MR. HUSMANN: Yes.

THE COURT: -- one of the reasons why -- turkey is a good example. That's one of the reasons why we cook turkey for a long time. So I don't -- are you hurt by that, relatively --

MR. HUSMANN: I don't know, your Honor, because I don't know what the issue is. I don't know what we're going to get into. I believe those terms would read on -- well,

the oven in my house, and I did consult my wife on this, and she suggested to me, well, if it's just relatively long, relatively low, well, if you put a turkey in your oven and cook it for eight hours at 275 degrees, that's relatively low and relatively long. People do that.

THE COURT: Well, I'm in a way hoist by my own petard here. Because I believe, and I believe the constitution actually requires, that I not address -- well, that I do claim construction and then separate from claim construction I address a motion for summary judgment, then I try the case, the case in controversy.

It just seems to me that I am supposed to, when they say there's a dispute, supply some language -- actually you see I'm not going for Holmes. They have "such as four to ten hours." And I thought, as I read this, I thought the fight was over ceramic. I've dropped ceramic out.

MR. HUSMANN: True.

THE COURT: I'm not going for that. And this heating element within the heating unit, this language doesn't say that.

It is -- you're right, it's a more general phrase. But as a working hypothesis, I'll revisit this, and I promise you I will revisit it, if the vagueness of the language becomes significant.

MR. HUSMANN: Fine. That's good.

THE COURT: All right. So then let's, let's talk about programmable controller. And again, I think it's helpful if I make a suggestion and you then -- this one we may be arguing about.

A programmable controller includes input and output devices such as the circuit board housing, a control panel, and an insulation shield.

Let's stop there. How about that?

MR. HOFFMANN: What does "such as" mean, your Honor? Because that's indefinite, and there are other terms that should be part of the controller, I think.

THE COURT: Well, your language, though, your language is in the form of, here you say a programmable controller in the form of an electric circuit including user, et cetera. What you dispute is this phrase "programmable controller."

MR. HOFFMANN: Yes.

THE COURT: And I tried to define that as including input and output devices, and then I gave examples. Now, when I use the words "such as," that is not exhaustive but it is exemplary. And it seems to me that in the terms of this patent that captures the idea.

What's wrong with that?

MR. HOFFMANN: Could we hear that again?

THE COURT: I'll try it again.

Programmable controller. Device that includes input devices and output devices such as the circuit board housing, a control panel, and an insulation shield.

And then you go on because -- you know, in the language of the patent.

MR. HOFFMANN: Right. So it's not limited to the "such as," those are examples of the exemplary.

THE COURT: That's how I intend it, correct.

MR. HOFFMANN: I think that's okay, your Honor.

THE COURT: All right. We'll turn to West Bend. What about that?

MR. HUSMANN: No, your Honor, I think it's directly contrary to the specification. It's contrary to the claims themselves. The claim itself.

THE COURT: Well, it may be contrary to the specification, or I won't say contrary. But -- all right. Now we've got an argument. Now let's go to the patent.

What -- where in the patent is there language that makes that construction improper?

MR. HUSMANN: I would first go to the claim itself.

THE COURT: Thirteen.

MR. HUSMANN: Claim 13.

THE COURT: I have it.

MR. HUSMANN: The patent itself, the claim requires, and we're referring to selecting a cooking

temperature and time, using a programmable controller mounted to a housing. I believe your definition says that the programmable controller, the housing is actually part of the controller, where this language says that you have to mount the controller to the housing. I think that's, so I think that's, the claim itself distinguishes between the two.

THE COURT: Perhaps, and thank you. That's directly responsible. I understood -- directly responsive. I understood you to be disputing a housing fixedly mounted to the heating unit. I'll get to that.

MR. HUSMANN: I think -- okay. I'm sorry.

THE COURT: And for that I was going to -- actually I propose, but Holmes isn't going to like that, to adopt your language "mounted to and located on the outside of the heating unit." So that the whole subsection there would read, as follows: Selecting a cooking temperature and time using a programmable controller which is a device that includes input devices and output devices such as the circuit board housing, a control panel, and an insulation shield mounted to and located on the outside of the heating unit.

Now, you're okay with that?

MR. HUSMANN: I am with the latter part, your Honor.

THE COURT: Well, what about --

MR. HUSMANN: I think the first part --

THE COURT: You people sort of broke it down and I was following your way. What's the matter with the first part?

MR. HUSMANN: I believe it, it does not distinguish, for one thing, between the controller and the housing. If we look at claim 13 there's two items, the controller and the housing.

THE COURT: Yes, the controller must be mounted to the housing.

MR. HUSMANN: Right. And housing is not part of the controller.

THE COURT: I don't --

MR. HUSMANN: But your definition would include the control panel and that's part of it. I think what you've defined is not the controller. You've defined what the specification calls the control. Control 200 in the specification of the patent includes the heat shield, the housing, the control panel, and the electrical components that are attached to the circuit inside the housing, the circuit board inside the housing. They're distinct elements of the control, not the controller.

Part of the problem with this patent is that they use the terms "control" and "controller" and they're too

similar. They do the same thing with programmable when we get to that and what is programmable. But the control, if you'll look at the patent at column 3 at line 12, it talks about the control 200.

THE COURT: Well, just one second.

MR. HUSMANN: And it says --

THE COURT: Column 3, line 12, I'm sorry.

MR. HUSMANN: Okay. It says, "The control 200 preferably includes a circuit board housing 210" -- that's the housing -- "a control panel 220, and an insulation shield assembled together for attachment to the outer sidewall." It then continues, "The interior of the housing contains a printed circuit board" --

THE COURT: Forgive me. What lines again?

MR. HUSMANN: I'm beginning at line 12.

THE COURT: Thank you. I'm sorry.

MR. HUSMANN: The sentence that begins "The control 200."

THE COURT: Yes. Okay. I'm with you now.

MR. HUSMANN: It identifies parts of the control. Not the controller, the control. And those parts include the housing, the control panel, the insulation shield, and in the last sentence the electronic components of the controller. And I believe what you're defining here as the controller is basically what the patent defines not as the

controller but as the control.

THE COURT: Well, where is the word "controller" defined?

MR. HUSMANN: I believe it's best defined in the figure, Figure 10 and Figure 13. It identifies exactly what the controller is.

THE COURT: All right.

MR. HUSMANN: If we could reference Figure 10.

THE COURT: I have Figure 10.

MR. HUSMANN: Okay. The item 302, which is the rectangular box in the middle, that is identified as the controller 302.

THE COURT: And that's found where?

MR. HUSMANN: That is found at --

THE COURT: It's referred to --

MR. HUSMANN: Column 4. It's paragraph 11. The paragraph that bridges column 4 and column 5.

THE COURT: All right.

MR. HUSMANN: It talks about the diagram, the preferred circuit 300 is preferably built around EPROM/ROM-based CMOS microprocessor controller 302.

THE COURT: Yes.

MR. HUSMANN: Okay.

THE COURT: And you are reading microprocessor controller as equivalent to programmable controller?

MR. HUSMANN: Well, I want to distinguish between -- I'm not saying it's got to be a microprocessor controller. But it is a controller. You can have a controller that is not a microprocessor. The controller, it can be hard wired with logic blocks. Okay.

THE COURT: I'm following you.

MR. HUSMANN: So what I'm equating it to, that's the controller.

THE COURT: I see. You're saying this is the definition of the controller.

MR. HUSMANN: Right. So if you look at the diagram, okay, the diagram on Figure 10 then identifies the controller, it identifies the LED, the light emitting diodes that are on the right hand side there, the D3, D4, D5. That's the, the diodes. Up above 304 is the Triac. These things are other electronic components; the switch is S1 and S2; the thermistor, which is 310. They're separate parts. They're not part of the controller. They are separate electrical devices.

THE COURT: All right. Well, then let me -- what then is wrong with Holmes' definition? Programmable controller is a form of an electric circuit using user actuated -- well, I don't know about user actuated -- including input devices and output devices which permit an operator to select a cooking temperature and cooking time,

and then we'll, we'll read on in the same fashion.

What's the matter with that?

MR. HUSMANN: Well, if you look at Figure 10 --

THE COURT: Yes.

MR. HUSMANN: -- the items that are distinct from the controller, such as the Triac, that is an output device. The controller controls the Triac. The Triac is an electrical device that will regulate the voltage going to the heating element so that the heating element, if it gets too warm it will shut it down or reduce the voltage, or if it's too low it will kick the heat back up. That's an output device. The controller, as its name implies, controls other devices.

THE COURT: I'm following you.

MR. HUSMANN: Okay.

THE COURT: Let me modify it.

MR. HUSMANN: And so --

THE COURT: Let me modify it.

MR. HUSMANN: Okay.

THE COURT: Programmable controller is a form of an electrical circuit affecting input devices and output devices which permit an operator to select a cooking temperature and cooking time.

How's that?

MR. HUSMANN: I'm not sure what the, how you're

using the word "affecting."

THE COURT: Well, I'm using it as a synonym for controlling it.

MR. HUSMANN: That controls -- here's -- you know, then you need to distinguish between inputs and outputs. The controller controls the output devices. They affect the output devices that you're talking about. The input devices are the devices that provide the signals or the information to the controller that tell it how to make those controls.

THE COURT: Well --

MR. HUSMANN: So it's a controller that is programmable and you program it with the input devices.

THE COURT: Still following you. A programmable controller is a form of an electrical circuit receiving, receiving input devices and affecting output devices which permits an operator to select a cooking temperature and cooking time.

Are you okay with that?

MR. HUSMANN: I would, I would suggest adding that it receives signals from input devices and sends signals to output devices.

THE COURT: Well, I, I think --

MR. HUSMANN: I think maybe your language includes that but that's --

THE COURT: It doesn't but -- all right.

Now, I've largely constructed this from your definition. What have I missed here?

MR. HOFFMANN: Well, I think the confusion that's occurred now is using the microprocessor controller which is really a component of the overall controller in a system. Because the system has to select a cooking temperature and time using a programmable controller.

So, when you look at the spec you have the control, programmable control, which includes many things, including the microprocessor. When you look at Figure 10 and 13 the microprocessor is one element, 302, of the programmable circuit 300. So you need the thermistor, you need the Triac, you need all these other factors in order to operate the system. So, the microprocessor controller 302 is one component.

THE COURT: Well --

MR. HOFFMANN: And you need --

THE COURT: -- don't you, don't you -- isn't that thought captured by describing how it operates here? "Which permits an operator to select a cooking temperature and cooking time." It's a form of electrical circuit receiving input devices, or I'll -- do you have a problem with his problem? Receiving signals from input devices and giving signals to output devices which permits an operator to select a cooking temperature and cooking time.

MR. HOFFMANN: The difficulty with that is that the actual signal is a part of the circuit. In other words, the steps of what you go through to do these different functions are part of the circuitry. And that's shown in Figure 10 and 13 and described in the spec. So you have a programmable controller, you have a programmable circuit, and then you have a programmable, a microprocessor controller, which is a chip or a little circuit board or something which is part of the circuit. It can't operate by itself to carry out the claim. You have to have the input and output devices as part of the circuit in order to carry out the structure of the claim.

THE COURT: But I've said that. A programmable controller is a form of an electrical circuit --

MR. HOFFMANN: That's fine.

THE COURT: -- receiving input signals from input devices and affecting signals to output devices which permits an operator to select a cooking temperature and cooking time.

MR. HOFFMANN: I still am a little concerned because it makes it sound like the circuitry doesn't include the input and output devices.

THE COURT: I see. I see.

MR. HOFFMANN: I think you really need that in order to operate the circuit. I mean, you might have an

independent user actuation outside.

THE COURT: Well, that I have -- but, with you, why don't we say a form of electrical circuit including input devices and output devices which permits an operator and so forth.

MR. HOFFMANN: That would be fine.

THE COURT: Have I lost something there that you see?

MR. HUSMANN: Yes, your Honor.

THE COURT: What have I lost?

MR. HUSMANN: The argument that we're having is whether or not the claimed programmable controller includes or excludes the input devices.

THE COURT: Yes.

MR. HUSMANN: That's the whole key.

THE COURT: I see. I see that.

MR. HUSMANN: Okay. And I think the argument --

THE COURT: I see that from your, from your argument and from your suggestion. His repost to what you led me through the patent is to say that a microprocessor controller is not equivalent to the word programmable controller but is only one component of that.

Let me, let me give him a chance.

Where in the patent now, now that I've isolated the real dispute, where in the patent is the definitions for

which you contend?

MR. HOFFMANN: Okay, on column 5, line 44, it talks about the operation of the appliance 10, which is the Figure 10, okay, which shows the entire circuit. It's identified programmable circuitry. Allows the user to set both the time, both the temperature and the desired time for cooking. The functions of the switches S1 and S2, which are activatable via the cantilevered portions 264 and 266 of the control panel 224, and it goes on and on.

So that includes, that is the programmable circuitry which is identified as number 30 in the figure -- 300, I'm sorry, 300, in the Figure 10 and then the microprocessor 302 is a component of that circuit. So when they're talking about the system it includes a microprocessor, or a substitute for it, and all the other structure you need, a thermistor to heat, a Triac, you know, everything else you need, and the switches to operate it. So that's what the difference is.

THE COURT: I'll hear argument to the contrary. This is key.

MR. HUSMANN: I think there's two issues. One, we're dealing with a claim that claims a programmable controller. It is not circuitry 300. It's programmable controller. Okay?

Second of all, the issue underlying the argument

that was just made is this idea of what is a circuit. But Holmes has never offered any definition of what a circuit is. A microprocessor is defined as an integrated circuit. That's how it's defined. It is itself a circuit. Circuitry 300 in this patent contains multiple circuits. The circuits to the diodes. The circuits to the thermistor. They're all circuits. The patent claims the programmable circuit which of those circuits in Figure 10 and 13 is programmable. That's what a programmable circuit is or a programmable controller. It's a circuit or controller that can be programmed. The only thing in the patent that's disclosed as being programmable is the microprocessor controller 302. That controller is defined as something that accepts input and puts output.

THE COURT: But he's right, isn't he, that if I limit it to the microprocessor controller the thing won't work. That may be the portion of the circuit that is programmable. But as you read this patent as an intelligible and unitary whole, you're going to have to have more circuits than that to actually select a cooking temperature and cooking time.

MR. HUSMANN: I agree with your latter conclusion. But I don't think from that you can conclude that therefore you have to put these other things in.

I'll give you an example. If you read claim 13 it

doesn't require a heating element. The claims don't have to put down everything that's necessary to make it work. It puts down different things, dependent claims, then add to it.

THE COURT: Yes.

MR. HUSMANN: Okay. So I think by saying that just because it won't work without having some input devices or, or affecting some output devices, the programmable controller, the microprocessor circuit is functionable and to take signals and to put output signals corresponding to the input signals, that's the definition of a controller, and the definition of a programmable controller, and it fits right with the intrinsic evidence in this patent when you look at Figures 10 and 13. It's a separate component from those input and output devices.

THE COURT: I'm not sure that it is. For our purposes here this afternoon, and I appreciate the argument, I think I'm prepared to define it.

Programmable controller is a form of electrical circuit or circuits including input and output devices which permit an operator to select a cooking temperature and cooking time. All right.

Now, on the -- but that portion of the claim goes on. Now, that programmable controller is mounted to and you dispute a housing fixedly mounted to a heating unit. And on

this, West Bend's approach seems to commend itself to the Court. Doesn't that mean mounted to and located on the outside of the heating unit? And since Holmes disagrees with that, I'll hear you.

MR. HOFFMANN: The disagreement, your Honor, of course, as I'm sure you perceive, is that the housing doesn't have to be limited to being on the outside. It can also extend inward. As our drawings show, it goes into the housing and you have wires and things connecting to the components on the inside. And it extends through the wall into the housing. So the embodiments shown in the patent show it going inside and out. So I don't think it should be limited to just outside.

Now, I don't know if your wording does that. Because we don't --

THE COURT: I didn't think of it that way.

MR. HOFFMANN: Because --

THE COURT: It's mounted to a housing. I'm --

MR. HOFFMANN: Right.

THE COURT: -- putting the housing for these wires on the outside of the heating unit. But nothing -- there can hardly be an inference that the wires can't go in. How, how would it work?

MR. HOFFMANN: The point is that part of the housing can extend into as well as being outside.

THE COURT: Well, you --

MR. HOFFMANN: There's no reason why it can't. And that's what we show in our patent.

THE COURT: I don't know that you showed the housing on the inside.

MR. HOFFMANN: If you look at Figure 7 you'll see that -- not 7. Yes, 7. You'll see the housing extends through the wall to the interior.

THE COURT: All right, I have Figure 7.

MR. HOFFMANN: If you look at the right hand side. You see the housing attached. And you see it extending within in 246.

So my only point is, I don't think there's any reason to exclude that.

THE COURT: What do you mean it extends within? Because the hatched line that's called out as 246 extends somewhat to the left as I'm looking at it of the vertical line 18?

MR. HOFFMANN: That's the wall. So it extends inside the outer wall. So I don't think you can restrict it to just being on the outside. I agree that it has to be on the outside, but all I'm saying is that it can also be on the inside.

THE COURT: Well, I don't know as it has to -- I don't know as that's on the inside. In a common parlance

this is how you get in there; isn't that right? This is how you --

MR. HOFFMANN: It has to be, it has to be inside.

THE COURT: And it's through this -- well, you feed the wires through this to, to operate the heating element, correct?

MR. HOFFMANN: You have to operate the parts of the circuit that are inside the wall. There's a number of components there.

THE COURT: No, I'm, I'm sticking with my construction. I don't think your concern changes it. Anyone would look at this, and more than that, it's not just anyone, I think the artisan skilled in this art would say that that component is on the outside. The fact that you've got that little lip through the wall there doesn't change anything in my view.

MR. HOFFMANN: What I'm saying is, I don't think that it's a fair interpretation to say that all the components of the housing have to be on the outside of the entire housing. You didn't say that in your wording. All you said was that the housing is on the outside.

THE COURT: That's what I said.

MR. HOFFMANN: And I'm saying why can't it be on the inside, too.

THE COURT: Well, because -- all right. Because

the way you teach this is outside, or at least overwhelmingly or generally outside, and I'm sticking to it for now. All right.

(Whereupon the Court and the Clerk conferred.)

THE COURT: All right, let's turn to the --

MR. HOFFMANN: Your Honor?

THE COURT: Yes.

MR. HOFFMANN: Can I interrupt you one second?

THE COURT: Yes.

MR. HOFFMANN: Is your interpretation now overwhelmingly or --

THE COURT: No, my interpretation is what I said. We'll see if this becomes a dispute --

MR. HOFFMANN: Okay.

THE COURT: -- later on. I look at this and I say it's outside.

MR. HOFFMANN: Okay.

THE COURT: Now --

MR. HUSMANN: I anticipate this is going to be the dispute, your Honor.

THE COURT: This one?

MR. HUSMANN: What you're talking about, the overwhelming, that is going to be the dispute.

THE COURT: Maybe it is. But for now the judge is with you so you are wise to --

MR. HUSMANN: That's fine.

THE COURT: -- leave me where I am.

MR. HUSMANN: I just didn't want you to think that that wasn't going to --

THE COURT: No. And believe me, you're all being very helpful. But now we're, we're working through this in a way that I find helpful.

All right. Now I'm in the '855 patent, claim 20, where we're talking about a programmable slow-cooking appliance.

Why ought I not adopt the same definition as I did in the '483 patent? And I'll call on Holmes first.

Won't the definition I adopted in '483 work here?

MR. HOFFMANN: Yes, your Honor.

THE COURT: It will. Then it is adopted.

Now, the language is a little differently -- a little different here. A housing fixedly mounted to --

MR. HUSMANN: Your Honor, could I address the programmable housing --

THE COURT: Yes, of course.

MR. HUSMANN: -- that you just talked about? I think there's two issues that have got to be clarified.

In the '483 patent the term "slow-cooker" appears not only in the preamble but in the body of the claim itself.

THE COURT: Correct.

MR. HUSMANN: And that's why -- I mean, I think, fine, you can interpret slow-cooker programmable is, that there's a programmable controller required in the claim and I think everything you talked about. Regardless of whether you address the issue whether the preamble is a claim limitation, when you get to the '855 there is no language in the body of the claim that calls for a slow-cooker, it is only in the preamble. And so, I think you have to address the issue of whether or not in claim 20 of the '855 patent the preamble actually makes claim limitations. And I think that is clearly no. There is no -- what they argued in their brief has an antecedent basis. It does not give life and meaning to the patent claims. The claims are what they are.

THE COURT: Because this is a method claim.

MR. HUSMANN: Pardon?

THE COURT: This is a method claim.

MR. HUSMANN: Claim 20?

THE COURT: Oh, I'm looking --

MR. HUSMANN: Claim 13 is a method claim.

THE COURT: Claim 13 is a method claim. Right.

MR. HUSMANN: Claim 20 is an apparatus claim.

And the preamble, it's only in the preamble that it talks about programmable controller. Or programmable --

THE COURT: Well, it only talks about it, but it uses, it uses the phrase in the claim. So I have to, don't I have --

MR. HUSMANN: Which phrase? It does not use the phrase "slow-cooker," I don't believe.

THE COURT: Well, then I --

MR. HUSMANN: In claim 20.

THE COURT: All right, just one moment, help me out on that.

So we're looking at claim 20. And I have, column 9, it starts, "A programmable slow-cooker appliance."

MR. HUSMANN: Yes, that's the preamble to the claim. Generally, preambles to patent claims are not claim limitations that need any interpretation. If you meet the elements of the claims you will infringe it whether it's a, quote, programmable slow-cooker or not. It doesn't make any difference.

THE COURT: Who do you represent here?

MR. HUSMANN: I represent West Bend.

THE COURT: Yes, that's what -- all right. I'm just -- it's interesting that you make that argument, which may reveal my own ignorance here. Because you think if I define it -- if I don't define it then this is broad enough, I suppose you're going to be saying, that it's obvious or anticipated, right?

MR. HUSMANN: Well, no. Here's my, here's my concern.

THE COURT: Yes.

MR. HUSMANN: You define it with this, what I've referred to at least as vague language. And you agreed you would revisit that if it comes true. Okay? I think --

THE COURT: If it's vague in a fashion that I need to define it, yes.

MR. HUSMANN: Yes. Right. Yes. I think we're going, I think what's going on here is, we're not trying to do this for infringement or take it out or anything else. We're doing it because that's the way patent law is written. I believe Holmes is trying to get this in so that they can exclude some prior art.

THE COURT: Precisely.

MR. HUSMANN: Exactly. That's why they're doing it.

THE COURT: That's why I --

MR. HUSMANN: And in order --

THE COURT: That's -- I just wanted to know the -- it would denigrate it to call it a game. I just wanted to know the strategy.

MR. HUSMANN: Yes.

THE COURT: Then, then here's what we're going to do. Here's what we're going to do.

I'm going to define it. I'm going to use exactly the same definition and I'm going to reconsider, if you will, as matter of law whether I should define it.

MR. HUSMANN: Okay.

THE COURT: That's your point.

MR. HUSMANN: Yes.

THE COURT: Your point in the brief.

MR. HUSMANN: Yes.

THE COURT: In all candor, I have prepared as well as I can for this hearing. But my focus has been what language will we use, and then the next round will be the motions for summary judgment on both sides or whatever, I'm not inviting them, but that will, then I will in the crucible of a real case or controversy have to make my determination and I can pick this up, this issue up again at that time.

I view, as is obvious, Markman as simply a discussion of appropriate definition. Interesting point. I'm not prepared for it. You haven't lost it. But if I have to define it now we have the definition.

So now we're set on that. And here, now we go on, and this time it says a housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit. And here again, I, I think West Bend has the better of it, though now I am beginning to see what the dispute is.

I would simply say mounted to and projecting from the outside of the heating unit. And your point is going to be the same one.

MR. HOFFMANN: Yes. I just want to point out here, too, to help my argument on this, if you look at dependent claim 29 you'll see that it talks about the housing extending into the sidewall. So that there is a basis in addition. For claim differentiation you have to have that capability in the independent claim.

THE COURT: All right. Well, then, then let's revise what I said. Suppose we say mounted to the outer sidewall of the heating unit and extending at least beyond an outer surface of the sidewall of the heating unit.

MR. HOFFMANN: That's fine, your Honor.

THE COURT: And you're okay with that?

MR. HUSMANN: I've got two problems with it.

THE COURT: Right.

MR. HUSMANN: One, if it's going to be extending, I think you're going to put this limitation in the independent claim, then it should be extending inwardly. At least a portion being able to extend into the heating unit. And I've got a diagram that will show you precisely what I'm talking about.

THE COURT: I'm happy to see the diagram. But what I'm tying to construe is language which says mounted to and

projecting outside. Aren't I adding something to say extending inward?

MR. HUSMANN: You are, your Honor, and I think it's mixed up in what are claim limitations. First of all, the fact that claim 29 says that you can have a projection that projects inwardly like is shown on the bottom of the chart I just showed you, I colored, the green portion that's colored is the projection that goes into, it projects from the outside toward the inside.

THE COURT: I'm with you.

MR. HUSMANN: That's what we're talking about.

THE COURT: Right.

MR. HUSMANN: Okay. And claim 29 identifies that green portion specifically.

THE COURT: Right.

MR. HUSMANN: What that means is that the independent claim, okay, would encompass such a thing. If you put the limitation in the independent claim now by interpretation you are emasculating claim 29. It's already in the independent claim. Claim 29 will have absolutely no meaning.

THE COURT: I --

MR. HUSMANN: So --

THE COURT: Go ahead.

MR. HUSMANN: So that should not be done.

What they have proposed is they have a claim, the way they proposed this is extending at least beyond the outer surface of the sidewall. And I think the language you used was something like that.

THE COURT: It was.

MR. HUSMANN: Okay. If you look at the top figure in the chart for the -- the housing is basically inside but there's a projection going outside. The claim language I believe you read would read on this embodiment.

THE COURT: Without further argument it would appear to.

MR. HUSMANN: And that would be wrong because the housing is no longer outside. That's not what projecting outside means. It doesn't say mount inside and a little bit project outside.

THE COURT: Okay, I hear the argument.

MR. HUSMANN: That's the point.

THE COURT: And I thought Holmes was okay with it, but let me, let me try it again.

A housing fixedly mounted to and projecting outside said continual -- continuous sidewall of said heating unit means a housing mounted to the outer sidewall of the heating unit and extending at least beyond an outer surface of the sidewall of the heating unit.

You're okay with that?

MR. HUSMANN: The language you used that I would object to is, you said the housing is mounted to an outer sidewall. And now we get into the inside surface, outside surface of the outside sidewall.

THE COURT: Mounted --

MR. HUSMANN: That's the problem.

THE COURT: Yes, mounted to the outside surface of the --

MR. HUSMANN: Of the outside sidewall.

THE COURT: -- of the outer sidewall.

MR. HUSMANN: Right.

THE COURT: You're okay with that?

MR. HUSMANN: Yes.

THE COURT: All right. Holmes, that's good enough for you, isn't it?

MR. HOFFMANN: Well, I don't understand why you changed that for the outer -- what was it, outer side --

THE COURT: Outer surface of the outer sidewall. Because he says otherwise the claim will encompass his top portion of the diagram here and will fail under claim differentiation.

MR. HOFFMANN: Your Honor, you can mount -- the question is -- it can be on the outside wall as you're saying, but it also can be mounted to the inside wall but extend on the outside wall or both. So why should it be

mounted. Where is it that, the reason for it to be -- are you saying it should be mounted outside the sidewall? It can be, it can be positioned there and also, you know, extending through. But it can be mounted to the sidewall. What's the difference where you mount it?

THE COURT: Do you -- just so I'm clear, take his diagram. Do you think that his upper diagram is encompassed within this claim?

MR. HOFFMANN: No.

THE COURT: You don't. Then I don't know what you're objecting to.

MR. HOFFMANN: As long as you have it on the outside surface you could mount it from the inside.

THE COURT: Oh, I'm okay with that.

MR. HOFFMANN: Yes. That's what my concern is.

THE COURT: I'm okay with that. So long as it's on the outside surface it can be mounted --

MR. HOFFMANN: Mounted.

THE COURT: -- from the inside.

MR. HOFFMANN: Right.

THE COURT: Put the nuts on the inside.

MR. HOFFMANN: That's right. That's my concern.

THE COURT: All right. And I think that that, it covers that.

Then that leaves us with programmable --

MR. HOFFMANN: Your Honor, could you read that again so I know what it says.

THE COURT: Well, I wasn't being as specific. I'll try it. Here we are.

A housing fixedly mounted to and projecting outside said continuous sidewall of said heating unit means that it is mounted to and largely outside the outer sidewall of the heating unit extending at least beyond an outer surface of the sidewall of the heating unit.

MR. HOFFMANN: That's fine, your Honor.

THE COURT: And that excludes, that excludes your top diagram.

MR. HUSMANN: I would agree, but you've now encompassed claim 29 by the last phrase that you added and rendered it superfluous.

THE COURT: I'll have to consider that. But for --

MR. HUSMANN: And I think if you're going to -- you defined which direction we're extending.

THE COURT: I'll have to -- that's for further consideration. All right.

Now, programmable circuit positioned within said housing. On this, West Bend, it seems to me, has the better of it.

What's the, what's the matter with that? I'll hear Holmes. See their proposal?

MR. HOFFMANN: I'm sorry, your Honor, this is, this is in regard to the circuit?

THE COURT: Programmable circuit positioned within said housing. That is the last thing I have to construe here this afternoon.

MR. HOFFMANN: Yes. I'm concerned that what they're talking about is only the microprocessor again because part of the circuitry can be positioned within and part of it without of the housing, as it is in all the embodiments.

THE COURT: Well, let's, let's talk through here. You don't claim that the programmable circuit now --

MR. HOFFMANN: Yes.

THE COURT: -- includes the buttons and displays found on the control panel.

MR. HOFFMANN: No.

THE COURT: All right. Now, the specification, claim 20 now, the specification lists in detail the details of the control panel, the components. And those are the ones that include indicator lights, switches, LEDs, and other displays. So you don't claim that the control circuit -- programmable circuit, excuse me, includes those.

MR. HOFFMANN: The programmable circuit is 300. I mean, it's got a number and it's shown in the figures and it refers to all of those elements. Okay? It doesn't, it

doesn't include, of course, the user interface. However, all the switches that operate setting temperature, time and carrying out the functions of the system are part of it. Now, some of those are on a microprocessor board or chip and some of them are not. And it tells you which ones are on and which ones are not in the various circuits.

So the programmable circuit as we see it has to be the assemblage of these components where you can, you could have part of it, as much of it as you want in the enclosure, some of it in the heating unit. And the spec talks about the fact that you can rearrange these in different places. You don't even need a microprocessor because you could do it by other electronic means. And it talks about that.

So there's, there's very specific arrangement of components there that are in the specification to explain to you what the circuit is. And it is not -- their definition wants it to be a microprocessor board.

THE COURT: So, I rejected that earlier.

MR. HOFFMANN: Right.

THE COURT: And you say I should reject it here.

MR. HOFFMANN: Yes.

THE COURT: Well, maybe we can do both. Let me try this. Suppose I defined this phrase programmable circuit positioned within said housing as a circuit including an assemblage of electronic components which allows the user to

program both the temperature and desired time for cooking and which can automatically change the heating element from a cooking mode to a warm mode once the set cooking time has expired, the circuit, not just a portion of the circuit, being positioned within the housing. The programmable circuit does not include the heating element, control panel, displays, and buttons.

Now, we'll ask Holmes, how do you like that?

MR. HOFFMANN: Could you read it once more, your Honor?

THE COURT: Maybe.

A programmable circuit positioned within said housing means a circuit, including an assemblage of electronic components, which allows the user to program both the temperature and desired time for cooking and which can automatically change the heating element from a cooking mode to a warm mode once the set cooking time has expired. The circuit, not just a portion of the circuit, is positioned within the housing. The programmable circuit does not include the heating element, the control panel, displays, and buttons.

What's the matter with that?

MR. HOFFMANN: Did you say the circuit, not a portion of the circuit?

THE COURT: That's what I said.

MR. HOFFMANN: Well, what about the elements like the thermistor and Triac and so forth that are not, they're not heating elements, they're part of the circuit.

THE COURT: Well, but you say a programmable circuit positioned within said housing. That means the circuit has to be inside the housing. It's fairly straightforward.

MR. HOFFMANN: Well, the spec doesn't have that.

THE COURT: But the claim does.

MR. HOFFMANN: Yes. But you've got to read the claim in light of the specification.

THE COURT: I do but --

MR. HOFFMANN: It doesn't show any embodiment or any suggestion that the entire circuit is in the housing.

THE COURT: Yes. But that's -- I have to read the claim in light of the specification.

MR. HOFFMANN: Right.

THE COURT: That's true. But it's the claim, as some wag has once said, not me, the name of the game is the claim. I can't read the specification contrary to the claim. The language "circuit positioned within said housing" seems to me to require that the circuit, not just a portion of the circuit, be within the housing.

Let me see what West Bend says about that. What do you say to that?

MR. HUSMANN: I am somewhat hesitant because you've identified some of the output and some of the input devices that you're going to exclude from programmable circuit.

THE COURT: But those --

MR. HUSMANN: The definition doesn't address the rest of it.

THE COURT: No, it doesn't because I don't know that he agreed with it. So I was doing that --

MR. HUSMANN: Okay.

THE COURT: -- specifically. He says, oh, no, not the control panel. So I knocked the control panel out.

MR. HUSMANN: Yes.

THE COURT: Displays and buttons seem to me to be part of the control panel. So I knocked that out. Obviously, the heating element is not part of this, so I knocked that out.

Now, you're right and you're following me very carefully. I didn't knock out the LEDs or switches. It seems to me that those can be placed wherever.

MR. HUSMANN: But they are part of the control panel.

THE COURT: Well, I'm not clear that that's so.

MR. HUSMANN: If you look at the patent specification, and I'm referring to the '483 because it's the same spec.

THE COURT: I'll accept that if it is.

MR. HUSMANN: If you'll look at column 3 at lines, I think it's 34. The numbers never line up in these claims. With all the technology you would think that you could --

THE COURT: I know. All right, but I've found it. Right.

MR. HUSMANN: Okay. The control panel includes a plurality of indicator lights, LEDs --

THE COURT: Such as LEDs.

MR. HUSMANN: Right. Such as LEDs. Okay? And then it talks about a variety of displays, et cetera. The LEDs are part of the control panel.

THE COURT: If I include the LEDs?

MR. HOFFMANN: Your Honor --

THE COURT: Do you have problems with that?

MR. HOFFMANN: I want to go back one step, your Honor. If you say that the entire circuit has to be in the, in the housing the system is inoperable.

THE COURT: Well, I didn't say it couldn't be connected to things. But the circuit that does this work, that programmable circuit positioned within the housing, it's got to be within the housing. That seems to follow from the language you have used in the claim. And, respectfully, I'm not going back.

Where do you want the LEDs? Are you going to have

them in the control panel?

MR. HOFFMANN: I think they're in the circuit.

THE COURT: You think they're in the circuit. What supports that in light of what he --

MR. HOFFMANN: Figure 10.

THE COURT: -- just said?

MR. HOFFMANN: Figure 10, which gives you the circuit.

THE COURT: All right, let's go back. Can I do '483 here? Figure 10 in '483?

MR. HOFFMANN: Yes, Figure 10 in '483 is fine.

THE COURT: All right. Show me.

MR. HOFFMANN: The LEDs are D3, D4, D5 --

THE COURT: I see them.

MR. HOFFMANN: -- D6, D7, D8.

THE COURT: Right.

MR. HOFFMANN: They're part of the circuit.

300 is a programmable circuit. It includes also the thermistor. It includes a microprocessor 302, thermistor 304. Thermistor is not in the housing.

THE COURT: I didn't say it was. But you're saying that the LEDs, because they're called out in the, as D4, 5, 6, 7, right?

MR. HOFFMANN: Yes.

THE COURT: That -- and what are these supposed to

be? These are --

MR. HOFFMANN: Diodes. Light emitting diodes.

THE COURT: Right. So the light emitting diode is there, and that's part of the circuit.

MR. HOFFMANN: Right. So 300 is the overall designation for the circuit. That's the programmable circuit. That's what it is in the spec.

THE COURT: I see it.

MR. HOFFMANN: And there's switches S1 and S2 also in there, which are switches that operate the circuit. The timing and temperature.

So that my point is that this is, this is really the circuit. And it's the only -- it's the circuit that's described in the specification. So when you look to see what the programmable circuit is, there it is, 300.

Now, all of that is not in the housing. Some of it is in the housing. It's in the housing. The circuit is in the housing, but not all of it.

THE COURT: What's not in the housing?

MR. HOFFMANN: Well, the thermistor 310 -- the thermistor 304. That's the Triac. Triac 304, thermistor 310 are not in the housing. They're components of the circuit. So it would be wrong to say that the entire circuit is in the housing only.

THE COURT: Well, you know, if I were to adopt that

don't I have to hold you to the specifications here? I thought that as the patent holder your position would be -- but I see, I see your problem. You're trying to stay away from the prior art here. You're -- the only thing that will be protected then is what is in this specification.

MR. HOFFMANN: No, that's not what I'm asking, your Honor. I'm asking you to interpret the language of the programmable circuit being in the housing. What does that mean? It means that it has a presence in the housing and it can also extend beyond the housing. There's no limitation on that.

THE COURT: It says positioned within said housing. I find it difficult to give it the construction that you are now contending for.

MR. HOFFMANN: But there is, there is no embodiment. There is no embodiment even, in the patent anywhere discussed and it would be inoperable.

THE COURT: Are you -- that's what I'm saying. Do you want me to hold you just to what the embodiments are in the patent?

MR. HOFFMANN: No. But, I don't want you to put us in, the only embodiments you're putting us in is one that is totally inoperable.

THE COURT: No, I'm not suggesting that it's inoperable. It seems to me it's got to connect somehow.

But what is defined as the circuit, it seems to me it must be positioned within said housing. And that means the circuit must be found within the housing. Maybe it's connected. Maybe these lights glow outside. But, we'll, we'll revisit this on summary judgment, but that for now is my interpretation of this claim.

Now, I think that resolves the business of this afternoon. Is that correct? Then we'll see.

MR. HUSMANN: I believe you're correct, your Honor, yes.

THE COURT: I thank you very much.

MR. HOFFMANN: Your Honor?

THE COURT: Yes.

MR. HOFFMANN: Your Honor, can I raise one more thing?

THE COURT: Surely.

MR. HOFFMANN: We have -- we haven't been able to address the summary judgment motion. We had one week to respond to that. Can we have another week to finish that?

THE COURT: Any objection to that?

MR. HUSMANN: I believe that the brief is due the 6th and our, and the hearing is on the 18th.

THE COURT: Well, I'll be all right with it on the -- so that would take us to the 13th.

MR. HOFFMANN: 13th.

THE COURT: I'm okay with that. Are you?

MR. HUSMANN: If we can get it -- well, let's -- can we do it -- the 13th is going to be a Friday. Can we get it on Thursday night?

THE COURT: Yes, you can.

MR. HUSMANN: Okay. And then we've got the weekend at least because --

THE COURT: You have until Thursday night.

Now, let me tell you something here, just as a matter of case management. We'll see who's left standing after summary judgment. But if you've read my decisions you know that -- and this is a jury case, right?

MR. HUSMANN: Yes, your Honor.

MR. HOFFMANN: Yes.

THE COURT: -- that now I bend over backwards to see whether there's something that a jury can actually determine. So, now you have my constructions. I intend to apply them reasonably, revisit all of these issues in the crucible of summary judgment.

But let's say that you all survive, or significant portions, the triable portion of this case survives summary judgment. I've done this once and I liked it so much I'm going to do it again. If anticipation, obviousness are defenses, and they are, I take it prior art --

MR. HUSMANN: Yes.

THE COURT: -- is a defense, when we get before the jury you're going first. And the reason I like that, and now I'm talking it up, is that the statistical, the studies by now -- has she been confirmed, Judge Moore? -- but the statistical studies by Kimberly Moore about patent casee, she knows more, statistically, we'll see how she is substantively, and I know her and hold her in great, high regard, as a judge, show that, she has argued that these cases go plaintiff because the plaintiff is the patent holder. I think a case should be tried right down the middle. And the commentators keep saying, well, the jury is in love with inventors and inventors hold the patents and therefore the inventor wins.

By trying the defenses -- and we're not going to divide the case. You're just going to go first. We're not going to then send the jury out. But you'll put on prior art, all of those defenses, I will charge as to clear and convincing evidence, then they'll put on infringement, and then we'll deal with damages and you can rebut damages. That's how we will try the case.

The great advantage of that is the jury sees what's out there and then they can assess how the patented device advances on the knowledge that's out there generally. I find that very helpful.

But, that's, if we're still standing after summary

judgment, and I look forward to seeing you at Suffolk on the 18th.

Thank you very much. If the case settles a simple phone call to Ms. Smith is all that's required. Don't make the call unless the case is really settled.

We'll recess. Thank you.

MR. HOFFMANN: Thank you, your Honor.

MR. HUSMANN: Thank you, your Honor.

THE COURT: All rise. Court is in recess.

(Whereupon the matter concluded.)

C E R T I F I C A T E

I, Donald E. Womack, Official Court Reporter for the United States District Court for the District of Massachusetts, do hereby certify that the foregoing pages are a true and accurate transcription of my shorthand notes taken in the aforementioned matter to the best of my skill and ability.

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